DOCUMENT RESUME

ED 354 880	IR 016 010
TITLE	Telecommunications and Education. Hearing before the Subcommittee on Communications of the Committee on Commerce, Science, and Transportation. United States Senate, One Hundred Second Congress, Second Session (July 29, 1992).
INSTITUTION	Congress of the U.S., Washington, D.C. Senate Committee on Commerce, Science, and Transportation.
REPORT NO	ISBN-0-16-040018-X; Senate-Hrg-102-1001
PUB DATE	93
NOTE	150p.
AVAILABLE FROM	U.S. Government Printing Office, Superintendent of Documents, Congressional Sales Office, Washington, DC 20402.
PUB TYPE	Legal/Legislative/Regulatory Materials (090)
EDRS PRICE	MF01/PC06 Plus Postage.
DESCRIPTORS	*Access to Education; *Distance Education; Educationally Disadvantaged; *Educational Technology; Elementary Secondary Education; Hearings; Higher Education; Information Dissemination; National Programs; *Online Systems; Rural Areas; *Technological Advancement; *Telecommunications; Telecourses
IDENTIFIERS	Congress 102nd; SMARTLINE

ABSTRACT

Testimony on the use of telecommunications technologies in education was given at this hearing. The focus was to examine how new and old technologies can be used to help schools and universities serve children more effectively and to extend the reach of educational institutions to rural and underserved communities. Although there is a great deal of technology in the marketplace, there is no coordinated effort at the national level to ascertain how it can be used most effectively considering limited financial resources. Statements by Senators Burns, Hollings, Inouye, McCain, Pressler, Stevens, and Jeff Bingaman were followed by an address by Diane Ravitch, Assistant Secretary of Education from the Office of Educational Research and Improvement, who reviewed uses of telecommunications technology in education and introduced the proposed SMARTLINE computer interactive information service that can be a beginning of a comprehensive distance learning system. Additional testimony about the use of educational telecommunications technology was provided by the following persons: (1) Kay Abernathy, Beaumont Independent School Boards Association, Texas; (2) Celia Ayala, Los Angeles, California County Office of Education; (3) Jack Clifford, Colony Communications, Inc.; (4) John Kuglin, Cold Springs Elementary School, Missoula, Montana; (5) Harry R. Miller, United States Distance Learning Association; (6) David Morgan, San Marcos Telephone Company; (7) Mabel P. Phifer, Black College Satellite Network (BCSN) and the Central Educational Telecommunications Network (CETN), Washington, D.C.; (8) Linda G. Roberts, Office of Technology Assessment; (9) Clyde Sakamoto, Maui Community College, Kahului, Hawaii; (10) Ron Schoenherr, South Carolina Educational Television Commission; (11) Carter Ward, Missouri School Boards Association; (12) Shelly Weinstein, National Education Telecommunications Organization/Educational Satellite Corporation; and (13) Pat Wright, TCI Educational Services, Englewood, Colorado. An appendix contains prepared statements and additional commentary by other interested parties. (SLD)

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HEARING

BEFORE THE

SUBCOMMITTEE ON COMMUNICATIONS

OF THE

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION
UNITED STATES SENATE

ONE HUNDRED SECOND CONGRESS

SECOND SESSION

JULY 29, 1992

Printed for the use of the Committee on Commerce, Science, and Transportation

U.S. GOVERNMENT PRINTING OFFICE
62-518cc WASHINGTON : 1993

For sale by the U.S. Government Printing Office
Superintendent of Documents, Congressional Sales Office, Washington, DC 20402
ISBN 0-16-040018-X

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TELECOMMUNICATIONS AND EDUCATION

WEDNESDAY, JULY 29, 1992

U.S. Senate,
Subcommittee on Communications of the
Committee on Commerce, Science, and Transportation,
Washington, DC.

The subcommittee met, pursuant to notice, at 9:33 a.m., in room SR–253 of the Russell Senate Office Building, Hon. Daniel K. Inouye, presiding.

Staff members assigned to this hearing: Antoinette D. Cook, senior counsel, and John D. Windhausen, Jr., staff counsel; and Regina M. Keeney, minority senior staff counsel, and Mary P. McManus, minority staff counsel.

OPENING STATEMENT OF SENATOR INOUYE

Senator Inouye. Good morning. This morning, we will receive testimony on the use of telecommunications technologies in education. We will hear from an array of witnesses and experts in the field of telecommunication and education. The focus of this morning's hearing is to examine how new technologies and old technologies can be used to help schools and universities serve our children more effectively and to extend the reach of the educational institutions to rural and underserved communities.

Educating this Nation's children is one of our highest priorities. It is personally of great concern to me. It seems trite, but it is correct, that our children are our future and our future is in grave danger. For example, 23 million Americans are illiterate, another 30 million are semi-illiterate, lacking skills beyond the eighth grade level. And this number will increase by 1.6 million per year. One out of every eight 17-year-olds is illiterate, 20 percent of all American workers are illiterate, illiteracy costs approximately $240 billion per year in lost productivity, crime, accidents, employee errors, training programs, welfare assistance, and on and on and on.

The most effective way to address this problem is to start with our children. As I said, our children are this Nation's most valuable resource, and we need to pay special attention to their needs. Child by child, we build this Nation and we need to ensure that they are equipped to meet this enormous responsibility. All of us are aware that children, especially young children, watch television a great deal. And I believe that most of us are familiar with these statistics, that by the time a child gets out of high school he or she will have spent more time in front of the TV set than in the classroom.

American children spend anywhere from 11 to 28 hours a week watching TV in their homes. By the time most children reach the

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age of 18, it is estimated that they will have watched between 15,000 and 20,000 hours of television, while they will have spent less than 13,000 hours in school. TV is, thus, the child's window to the world. To some reasonable extent it should not only entertain, but also inform and educate.

At the same time that our children are watching more television we place an extraordinary role upon the shoulders of our teachers. At one time, school teachers were highly respected members of the community, and unfortunately that is no longer true. Teachers used to be well paid, but they are no longer, especially in comparison to the job we have asked them to do. And today, we want them to be, in addition to a teacher, a babysitter, a psychologist, a substitute mother, a disciplinarian, and much, much more.

We must invest in our future by devoting more resources to reach youngsters in their prime learning ages. There is an abundance of evidence that technology can be very effective in supplementing children's education, both at home and in school. Bridging the separation between student and teacher through distance learning makes the potential for education limited only by one's imagination.

And so the time has come to join together and develop a comprehensive program on what to do about our young people. If we want future leaders for our Government and for our industry, if we want to be able to hold our own in the world decades from now, we must begin to put our words into deeds. And the media, with its proven record of being able to educate, has a very vital role to play.

The purpose of this morning's hearing is to discuss using technology to deliver targeted educational and instructional services to schools, universities, and homes. There is a great deal of technology in the marketplace now, but there is no coordinated effort at the national level to ascertain how it can be used most effectively considering our limited financial resources. And so I wish to thank all of you for joining me here today, and I look forward to your testimony.

Mr. Chairman, your comments, please.

OPENING STATEMENT OF SENATOR HOLLINGS

The Chairman. I am pleased that the committee is holding this important hearing today. I also thank the panelists for participating, especially Ron Schoenherr with the South Carolina Educational Television Commission.

I always have been a strong believer in improving and expanding the Nation's educational system through the use of telecommunications technology. In South Carolina, for instance, the educational system has been greatly enhanced through the technology initiatives instituted by South Carolina Educational Television. SCETV has many programs that serve as models of how to provide programming to both urban and rural schools and homes across South Carolina and the Nation.

The South Carolina schools also have benefited from the Satellite Educational Resources Consortium. This partnership of educators and public broadcasters has succeeded in providing live interactive satellite-delivered courses, proving the value of a distance-learning network.

These are but two examples of how innovative uses of our communications networks can be used to improve the Nation's educational system. I look forward to learning more from this hearing about new ways we can improve education through the use of telecommunications technologies.

Thank you, Mr. Chairman.

Senator INOUYE.Thank you, Mr. Chairman. Senator McCain, would you like to make a statement?

OPENING STATEMENT OF SENATOR McCAIN

Senator MCCAIN. Thank you, Mr. Chairman, and thank you for holding this hearing. I think it is indicative of the view that you have toward the problems that face our educational system in America and our continuing effort to try to solve some of these problems and improve dramatically what is perhaps our Nation's most difficult and compelling problem.

The importance of promoting a partnership between the telecommunications industry and our education system has never been of greater urgency, nor has it been so close to our grasp as it is today. Everyone in the Nation has heard over and over again that students in the United States fall far short in the areas of math and science when compared to students in other nations. The deficiencies in the sciences are striking and get the most attention. But it is clear that education in all studies and disciplines cries out for greater improvement.

The advancements in telecommunications that we are going to hear about this morning have made the opportunity to bring formal education programs to even the most remote areas of my State of Arizona and the rest of the country virtually limitless. I believe that Congress must be committed to examining what its role should be in establishing a successful partnership between the industry and educators to the best advantage. In limited fashion, we have seen how successful distance learning can be in reaching students of all ages who want an education. Now, we must focus on how distance learning can be implemented on a widespread basis throughout the country.

I appreciate the time and effort of the witnesses here, and I look forward to hearing their testimony.

Thank you, Mr. Chairman.

Senator INOUYE. Senator, thank you. Senator Burns, care to make a statement?

OPENING STATEMENT OF SENATOR BURNS

Senator BURNS. Thank you, Mr. Chairman, and thank you for holding this hearing this morning.

First of all, I want to congratulate you and recognize you on your dedication to using technologies, and new technologies in communications, that we have experienced together since I came into the U.S. Senate back in 1989. I do not think there is a man in this body who has sat through more hearings, taken more information, and has been more patient on these really tough issues, policy issues in some cases, than Senator Inouye has.

There is a consensus in this country that we have to find new and better ways to educate our children. For all the reasons that our chairman this morning mentioned, from Montana to Maine, from the length and breadth of this country, educators are looking for those new ways, new technologies, and they are emerging. There is an overcrowding in the urban areas, the lack of access to educational opportunities in many rural areas, and everywhere we turn there is one thing very evident, that is, budgets are squeezed. And while there is a consensus that something needs to be done, there is no consensus of what that something is. There is not even a consensus on the topic that we are here to discuss today, the role of telecommunications in education.

New tools are being made available to teachers through technology, tools that my wife Phyllis did not have in her teaching days, tools that America needs for greater access today, and tools that most educators will have to access in the days ahead. And let me stress that these tools will not replace teachers, but rather enhance teachers' ability to do their jobs more efficiently and more effectively.

What are these tools and who is using them now? How do we make them available to more educators? These are the questions that I hope that we can address in part today, because in America every student deserves equal access to a quality education. Unfortunately, however, not every small rural school or poor inner city school can afford the resources and specialized instructors that are available in the larger, wealthier communities.

Distance learning can help us meet those challenges that we face in that area, whether it be through copper wire, coaxial cable, satellites, or fiber optics, distance learning can provide access to the vast educational resources of our Nation, regardless of the wealth or geographical location. In fact, many of the rural communities that I represent, the availability of advanced telecommunications technologies is critical to their very survival. And without this technology, schools, health care institutions, cannot be sustained. And without those facilities' educational and health care these communities will simply not survive. They will die and go away.

That is why I take such a deep personal interest in the issues that we will be discussing at this hearing. We must remove some of the barriers that are holding back the full development of distance learning. I have introduced S. 1200 that will remove some of those barriers and facilitate the deployment of broadband fiber optic networks available to every educational institution, health care organization, business, and home in the United States by the year 2015.

With a fiber optic network, schools can access any library in the United States or the world. Students can browse through instructional text, graphics, and video on any subject. And with a fiber optic network, any school in the country could have guest teachers from anywhere in the world via two-way interactive audio and visual network. What a way to spark the imaginations of children today.

The technology, itself, may be the motivator for some children who otherwise would have no interest in school at all. When you trip the imagination of the young, you have unleashed a powerful,

powerful thing. This would give America's children unlimited opportunities to learn. We could use that technology to bring more choices and opportunities to every student in every school, and that is the American way, that everyone has access. And the impact on education would be dramatic.

But even with the passage of S. 1200, this network may not be a reality for some time. But we cannot wait to provide some of the opportunities available through distance learning. We must start right here, right now, by taking advantage of satellite technology that exists today. And it is for that reason I have introduced S. 2377 to address some of the barriers that are stunting the growth of distance learning via satellite.

The use of satellites is currently the most cost-effective way to deliver instructional programming to the greatest number of schools. Satellite transmission provides a way to reach students no matter where they are or how remote. However, in today's satellite market, the education sector is fragmented and commercial market practices leave educational institutions without low cost, dependable, and equitable access to the services. S. 2377 provides loan guarantees for non-Federal, nonprofit entity to acquire satellite dedicated to instructional education. And that satellite would give instructional programmers unlimited, affordable access to satellite time. It would also allow educational programmers to collocate in one place in the sky, thereby providing more program choices to educators with the least amount of technical hassle.

We will be hearing from Shelly Weinstein today representing that one entity and what they are currently undertaking in making such an effort.

On other fronts, the cable television industry, through cable in the classroom, mind-extension university, the CNN Newsroom is demonstrating on a daily basis the value of combining communications technology and educational programming into the classroom. And I look forward to hearing Montana's own John Kuglin and his two young students, Kayla Brosious and Jayson Slater, about how he has been able to put this program into use. We are pleased to have with us Pat Wright, director of TCI Educational Services. And I want to thank you, Mr. Chairman, for accommodating our request to have these witnesses present today.

Public broadcasting continues to be a substantial contributor to America's schools through instructional programming and satellite capacity, as well. But no one technology or industry segment will provide all links or programming for distance learning in America. It will be a combination of all available technologies, which will result in the best educational opportunity for America's kids.

In addition to providing the most advanced telecommunications infrastructure in the world to our educational institutions, we must ensure that each school has the necessary equipment in the classroom and take full advantage of the advanced networks of the future. And we must also provide for the training of our Nation's teachers in how best to use these tools for educational instructions.

I look forward in working with you, Mr. Chairman, to make distance learning a part of the solution to America's educational challenges. It is a pleasure to be here today and to hear these creative people as they bring their stories to the table here in the U.S. Senate. I would, if it was up to me, Mr. Chairman, I would flop the order of appearance because I think we have some folks that are located here in Washington that maybe should see and hear the testimony of those who are putting this technology in practical use across the nation.

Thank you very much.

Senator INOUYE. I thank you very much, Senator. Senator Stevens.

OPENING STATEMENT OF SENATOR STEVENS

Senator STEVENS. Thank you, Mr. Chairman. I am here just for a moment, really, because of the Appropriations Committee, but I wanted to tell you that as a member of the board of OTA, and I see you have Ms. Roberts coming to testify, we already have underway a study now of the feasibility of using this satellite technology. It is primarily being conducted in my State, as a matter of fact, because I think if it will work in Alaska it will work anywhere in the country. But my message to you is this: I support the concept of a level playing field for rural children and those in the inner city and the urban areas of the country as far as education is concerned, but I hope we do not stop there. Once exposed to this technology, these children in the rural areas must have job opportunities and equal access to the job opportunity base, too.

I believe that satellite communications and technology is going to give us the ability to let young people in Nome compete with those in Reston for the application computer technology for research for the Federal Government, and that telecommunications will make that possible. We can return to the concept, really, of cottage industries and let these jobs be available to people in rural areas once they are fully educated in the utilization of this new technological base for the United States.

I do believe when we look at the feasibility of education we have to look at the feasibility of applying the skills that they will be able to learn and the total knowledge they will be able to gain through satellite education to a job base right there at home. This is something, I think, that can be done and should be done. I am exploring it right now with the Postal Service, as a matter of fact. I believe we will be able to demonstrate that through the use of telecommunications we can provide additional jobs to rural America through this same technology.

I thank you, and I reflect also on what Senator Burns said about your commitment to these goals, these educational goals, and we are all pleased to be able to work with you on it. Thank you.

Senator INOUYE. I thank you very much, and I quite agree with you, and I will be joining you in the Appropriations Committee shortly.

Senator Pressler, would you care to say something?

OPENING STATEMENT OF SENATOR PRESSLER

Senator PRESSLER. Thank you very much, Mr. Chairman, and thank you for holding this hearing. Let me say that I share the great interest in the use of our telecommunications infrastructure to give educators and students access to information from any location. And coming from the State of South Dakota we are particularly interested in this, although it applies as much in the city of New York or the inner city of Washington, DC. I believe distance learning will soon revolutionize the way we educate our children. Telecommunications technologies will soon allow teachers and students to access a new universe of educational resources and research choices.

Fiber optics, satellites, and telecomputers are just some of the tools educators will be using. In my lifetime, I have witnessed the development of the computer. This single tool has brought America into the information age and made distance learning a reality. While I was a student at the University of South Dakota, a computer used to process basic mathematic functions was larger than this room and could cost millions of dollars. It required an army of engineers to maintain the maze of refrigerated tubes and wires, along with a team of computer experts to operate the computer long enough for any work to be done. In fact, I remember working for Ford Motor Co. when the IBM 1401 was being used, which is pretty ancient.

Today, I can carry in one hand a computer with 100 times more power than those older machines, and it costs less than $2,000. The trend toward faster, smaller, more powerful computers will continue in the 21st century. In fact, at the current rate of advances in microchip and transistor technology, within a decade a portable computer could equal the output of today's Kray Supercomputer and cost less than $100. This explosion in computing technology soon will make the computer as affordable and ubiquitous for educators and students as the telephone or television.

Today, we have technology to merge the telephone, computer, and television, into one telecomputer. Placing telecomputers in schools will enable students to receive, store, and transmit voice, data, and high-definition video products. Using a telecomputer, an educator will be able to talk face to face with a pupil far across the country. A biology teacher living in Rapid City, SD, will be able to telecommunicate over a light wave network to his classroom in Chicago, where he could talk face to face with his students and have immediate access to documents over a high-definition telecomputer screen. Interactive video will allow many small rural schools to lessen expenses by sharing teachers. Students in Belfoos, SD, could attend a physics course in Yankton with a professor lecturing and answering questions over a high-definition, flat-screen TV.

Distance learning will also transfer continuing education for adults. No longer will adult students be forced to shift working schedules, find a babysitter, and drive to a classroom miles from home. Students would choose what they wanted to learn, when they wanted to learn it, whether it is a lecture on American history in the 1860's or a demonstration on how to overhaul a diesel engine. Students could receive the video package on their telecomputers in a burst of light, store it digitally, and replay it at their convenience.

Computer technology is proceeding at a pace that will soon make this vision of the future a reality. Yet all the computing power in the world is useless if the information it produces cannot be shared with others. While microchip and transistor technology will soon make telecommunicators a reality, some policymakers are fighting the idea of distance learning. Mr. Chairman, at the dawn of the Industrial Age, a band of English working men called the Luddites destroyed industrial machinery. The Luddites believed newly installed labor-saving machinery would eliminate their jobs and cause them great economic pain. What actually happened was an economic explosion that reshaped the entire economic and societal landscape. The fears that technology would limit opportunity proved to be unfounded as technology created new wealth and opportunity.

Perhaps today there are some Luddites in our society who fear some of the new technology. But actually, it benefits them. Today, at the dawn of the Information Age, there are many who fear the development of fiber optic networks. The technological Luddites of today say educators do not need or want the services that could be provided by distance learning. Currently, this may be true. However, once distance learning begins to become a reality, educators will realize the potential of this new tool and will begin to develop many educational services. The demand for these new services will further encourage the growth of distance-learning tools.

Mr. Chairman, in conclusion let me say that it is important with all our focus on new technologies, we must recognize that the key to success in distance learning is our teachers. Distance-learning technologies will not replace the teacher. Rather, it will be an enhanced educational tool for them. Mr. Chairman, we need to coordinate communication and educational policy. The policy we formulate today impacts greatly on our ability to educate future generations of American students. Visionary thinking is needed to help unleash distance-learning technology. The hearing today is part of that process.

I look forward to the testimony of our witnesses, and I thank you very much.

Senator INOUYE. Thank you very much, Senator. I have taken the liberty to invite to participate in this hearing this morning the gentleman from New Mexico, Senator Bingaman, because of his well-established leadership in telecommunication. Do you have anything you would like to add to our hearing?

STATEMENT OF HON. JEFF BINGAMAN, U.S. SENATOR FROM NEW MEXICO

Senator BINGAMAN. Mr. Chairman, I compliment you, as well, on your leadership in organizing these hearings. I appreciate the chance to be here. I will not delay the committee with any opening statement, but you have an excellent set of witnesses and I look forward to hearing from them.

Thank you.

Senator INOUYE. Thank you, Senator.

And now, I'd like to call upon the first witness, the Assistant Secretary, Office of Educational Research and Improvement of the Department of Education, the Honorable Diane Ravitch. Madam Secretary, welcome, ma'am.

STATEMENT OF HON. DIANE RAVITCH, ASSISTANT SECRETARY, OFFICE OF EDUCATIONAL RESEARCH AND IMPROVEMENT, DEPARTMENT OF EDUCATION

Dr. RAVITCH. Thank you. Mr. Chairman, I wonder if I might invite my special assistant for technology to join me at the witness table?

Senator INOUYE. Please do.

Dr. RAVITCH. Mr. James Mitchell, who is the Special Assistant for Technology in my office.

I thank you for inviting me to speak today. It is a great honor to present the views of the Department of Education on the role that telecommunications can play in the improvement of education. We believe that technology and telecommunications will be key in helping the Nation reach all six of its education goals, from the early childhood learning and getting children ready to learn, to the learning of high-standard subject matter.

Our Nation is now in the process of fundamentally rethinking what constitutes a good education and how it can best be delivered to all children. A changing world requires changes in education. I am a historian of education, and I know that over these past 200 and more years education has changed. But in the past 50 years it is really not changed as much as our society has changed. Our society is changing rapidly. Our schools have not kept up with technological change. In fact, as many of you know, many of our children are still in schools that look very much like their 19th century predecessors. So, we live in a society that is hurtling toward the 21st century while our schools continue to be rooted in 19th century practices and programs.

The beginning of changing our schools is not simply installing more technology. You must ask the question, "Technology for what purpose?" And when you look at schools you must ask the question, "What is it that our children are learning?" because that is where you must begin. You must begin with goals. And goals mean setting standards as to what you expect children to learn. In this past year, the Department of Education has begun to support the development of voluntary national standards in all of the key subject areas. This has already happened in the area of mathematics, led by the National Council of Teachers of Mathematics, and the Department of Education has awarded grants in science, in history, in geography, in the arts, and civics, and we hope one day soon, in English.

The setting of standards is very important because it brings together all the subject matter specialists from across the country and develops a national consensus about what we want our children to learn. The States have to become involved in setting their own State standards, and many States are already doing this. We need new assessments of children. The old assessments, which are based on assessments that were originally developed in the 1920's and the 1930's, are no longer adequate to the needs of our society, and thus we do need to find better ways of assessing what our children learn. We need better instructional methods, and this is where technology comes in. We need better teacher education. We need better teacher training. All of these changes begin by understanding what it is you want children to learn. When you understand that this represents the what, then the how has to include technology. Technology will play a very large role in changing education and providing better education for all of our students.

The Department of Education is supporting wide-ranging efforts to expand and enhance the use of technology in the schools. We do not advocate a single technology, but rather supporting educators examining appropriate applications of many different technologies. We know that there are many different technologies at work in the country. In this past year, I have traveled and visited many of your home States and seen wonderful programs that are being developed by educators and by consortia around the country where distance learning, fiber optics, interactive hypermedia, all sorts of things that are simply dazzling, are beginning to develop. They have not yet penetrated very many schools. But it is a revolution that is happening and I think we should encourage it.

Let me describe for you some of the things that we are doing currently. We have proposed in our 1993 budget an initiative that we call "Access to Research Through Technology," and this is a new initiative that includes SMARTLINE. SMARTLINE is a computer interactive information service. It really is the beginning part of distance learning. We requested $6 million to initiate SMARTLINE. We are spending our own discretionary funds this year to do the basic research on how to get it up and running, what the requirements are of the system.

SMARTLINE is the beginning—and I should tell you that it is a wonderful acronym. It is Sources for Material and Research About Teaching and Learning for Improving Nationwide Education. And I say, can you top this?

It is the beginning of our effort to initiate distance learning on a broad scale. SMARTLINE is the first step of what we call "U.S.A. On-Line," which is to be a comprehensive distance-learning system. And we requested in the 1993 budget $1 million to initiate work on U.S.A. On-Line. And also we requested as part of the 1993 budget, funds to be able to develop videos, audiotapes, not to have the U.S. Department of Education develop them but to contract with others to develop them, so that we might be able, for example, to develop videotapes about good parenting practices, how to help young children grow up ready to learn. Video is very powerful. It is one of the many technologies that we ought to be using much more aggressively.

This current year, 1992, we have had a $6 million competition, a single grant, for a high-technology demonstration project. That competition is not yet concluded. We have, within the Department of Education and within my office, OERI, the Star Schools Program which has a budget of $18.4 million. It reaches 48 States, the District of Columbia, Puerto Rico, and other places.

And we use technology because we are an office of educational research. We have all sorts of applications of technology within our own activities. We have the ERIC system, which is an immensely successful high-technology information system that goes worldwide, and last year there were 100,000 users of the ERIC system.

We also support a Center for Research on Technology. Sad to say, our 1993 request for technology, which may seem modest when you consider the cosmic needs of technology, our very modest requests are not being funded by the House Appropriations Committee. I do hope that the Senate Appropriations Committee will look more favorably on our effort to jump start the use of technology in education.

When fully implemented, SMARTLINE, which is our major technological initiative, will provide access to up-to-date information on all sorts of things that people in education need to know. People all over the country need to know what are the best programs and best practices, and they need quick access to this. They do not want to wait 5 years to find out that there is a good program one State away.

We would like to be able to provide a job bank for teachers, so that someone looking for a teaching job or someone looking for a teacher with a particular skill would be able to go to SMARTLINE and quickly access classified advertising for teachers.

We would like to be able to provide information about funding resources, so that, for example, if a teacher or if a school district wants to know what kind of funding is available from the Federal Government for their district or for their own particular needs, they would be able to quickly find out what's available, not just from the Department of Education but from every part of the Federal Government, and it is possible that other funders like private foundations might want to join SMARTLINE, as well.

We see this as a source of conferences amongst teachers, conferences amongst urban superintendents, a way of exchanging information. And we see it not just as a text system, but as a video system, a system in which people can, in fact, provide instruction and exchange videos about successful programs.

There are many, many different uses of the system. We think it should be started, and we are hopeful that the Senate Appropriations Committee will allow us to begin this very, very important initiative. I would say that of all of the work that we are proposing now, the one that gets the most enthusiastic response is the work on SMARTLINE. So, I think it would be simply tragic if, given the interest in technology, the Department of Education were unable to begin any technological initiatives because of the prospect of level funding.

The SMARTLINE system, as we foresee it, would go into every place where there is a modem, to every public library, to every public school, to everyplace that was able to access it. In addition, we would see the SMARTLINE system as one that would be available through an 800 number and that would be in public libraries in every community in the United States. This is, I must say, the first step in a major distance-learning initiative. I see this as tied to Star Schools and also tied to the ERIC system, building on the strengths that we have within the Department of Education from our experience with these other two very successful initiatives.

We have requested for 1993, $18.4 million for the Star Schools Program. Star Schools goes into 5,000 schools in 48 States, as I said before, District of Columbia, Puerto Rico, and the Virgin Islands. Star Schools brings advanced courses to schools that cannot afford the subject matter particularly in math and science and in foreign languages. Students through Star Schools can learn Japanese, they can take advanced courses in mathematics and in science, and I have heard of students who are now in college who would not have been able to get into colleges, but for the instruction they received through the Star Schools Program.

So, at the Department of Education we are strongly committed to technology. We understand its power. We think that we should be able to be in a position to launch SMARTLINE. We should be in a position to advance distance learning. I have seen demonstrations throughout the country of the kind of creative thinking that is going on. I think that ultimately, if we were able through SMARTLINE and through the development of U.S.A. On-Line, to truly build a distance-learning system, we would have a country in which anyone, anywhere, would be able to turn on their television and learn whatever they wanted at their own pace. That, of course, is a vision of the future, but I know that it is a vision that would change the nature of learning in this society. It would mean that you could wake up at 6 o'clock in the morning and learn algebra or Chinese art or African history or whatever you chose to do.

So, this is the vision that the Department holds. I hope that we have the funding to begin to take the first steps toward that vision, and I am glad to have the support of this committee in doing so, and I welcome your questions.

[The prepared statement of Ms. Ravitch follows:]

Prepared Statement of Ms. Diane Ravitch

Mr. Chairman, distinguished Senators of this Subcommittee, I'm pleased to have this opportunity to describe to you the views of the U.S. Department of Education on the role that telecommunications and technology can play in reaching the six National Education Goals and improving education for all students.

Our nation is currently engaged in a fundamental rethinking of what constitutes a good education and how it can best be delivered to all children. The world has changed, and the education that may have sufficed for earlier generations is no longer good enough today. Our workers and entrepreneurs are competing in a global marketplace against their counterparts in other advanced societies. Further, our modern society requires that American citizens be able to develop informed opinions on topics as far-ranging as global deforestation, biotechnology, and the politics of the Middle East.

Despite these changes, our students are currently educated in schools that largely reflect the customs and pace of another era. Not only are our schools still closed in the summer, a practice that dates back to the 19th century, allowing students to help harvest the crops, but they are one of the few institutions that remain almost untouched by the technological age.

We must transform our schools so that all students can reach higher standards of achievement than ever before. As part of AMERICA 2000, the President's strategy for meeting the National Education Goals, the Department is supporting consensus-building efforts by independent professional groups to develop World Class Standards in the core subjects describing the knowledge and skills all students need to know. The Department also has requested funds to assist States in implementing reforms designed to help students meet the standards, including state curriculum frameworks, teacher education and professional development, and school restructuring. Increased and better use of technology in education is a key aspect of the basic changes that will be necessary if we are to succeed in improving the performance of all students.

Advances in using technology in education so far have been slow and piecemeal. Most schools now have some computers, but rarely are they sufficiently integrated into the teaching process to take full advantage of their potential for improving student learning. New technologies have great capacity for capturing students' attention as well as allowing teachers to individualize instruction to fit student needs. Distance learning can expand students1 opportunity to study challenging courses for which local teachers may lack knowledge or training. And educators themselves can benefit from improved methods of communication that connect them with each other and the latest developments in their fields.

The U.S. Department of Education is supporting efforts in all of these areas to expand and enhance the use of technology in our schools. In the Office of Educational Research and Improvement (OERI), these efforts include: Access to Research through Technology, a new initiative that includes SMARTLINE, a computer-based information service linking teachers, school administrators, parents, and community members; a $6 million competition for a high technology demonstration project in a school district; the Educational Resource Information Center (ERIC); and the Star Schools program.

OERI also is using new methods of disseminating research materials. Both ERIC, the world's largest compilation and index of education materials of interest to teachers, administrators, researchers, and the general public, and the National Center for Education Statistics (NCES), which conducts national surveys and samples such as the National Assessment of Educational Progress, make their materials available in CD-ROM, diskette, and tape format. Since these are all computer readable data files, highly targeted information can be rapidly retrieved.

Several major dial-up telephone links such as DIALOG, ORBIT, BRS, and international vendors offer access to ERIC material. As an indication of the demand, it is estimated that 100,000 hours of on-line search time has been put to use in the last two years. In addition, access via INTERNET is planned this coming year, making OERI's materials available on the Nation's largest computer network—spanning nearly all universities, research centers, and some elementary and secondary schools.

Direct distribution of the entire ERIC and NCES dataset is becoming increasingly cost effective. The CD-ROM's storage capacity allows for the low cost dissemination of these very large files. The rapidly increasing demand for the CD-ROM versions, for example, is being met through contracts with several firms. Just this spring, ERIC demonstrated new, full-text CD-ROM delivery of its educational research digests and documents at the American Libraries Association Conference. This will essentially place a library of current research results on a few CD-ROM disks—at the immediate disposal of the user. For FY 1993, the Administration requested $15 million for Access to Research through Technology, an education technology and communication strategy that includes several key components: products on videotape and computer disk for educators, community leaders, and parents on helping to improve student learning; support for teacher training to assist teachers in making the best use of new technology; support for research on using technology in the classroom; and SMARTLINE (Sources of Materials and Research about Teaching and Learning for Improving Nationwide Education).

SMARTLINE is the first initiative undertaken as part of this comprehensive strategy. When fully implemented, SMARTLINE will provide up-to-date information on:

- research results and statistical information on education,
- promising programs and practices,
- an educational job bank for teachers, including every school and school district that wishes to participate,
- demonstration projects and practical applications of innovative ideas from practitioners and community members,
- sources of advice and assistance to educators, parents, and community members, and
- current funding opportunities for individuals, school districts and schools, (such as teacher fellowships and grant competitions), in a database that includes information from each federal agency not only the Department of Education.

Through SMARTLINE, a curriculum committee in a local school district working on improving its science curricula could have immediate access to standards and curriculum frameworks developed by other districts, states, and science professional organizations. A principal intent on reducing the number of dropouts among the school's at-risk youngsters would have at his or her fingertips information on a variety of approaches for doing so. A parent or community group worried about illicit drugs in the local schools could find examples of schools recognized for their anti-drug programs as well as recent publications by the Department of Education in this area. A teacher could exchange ideas and share innovative programs and practices with other teachers about improving instruction.

The Department intends that SMARTLINE will be accessible wherever existing communications networks are operating or through a computer, modem, and telephone line. Persons unable to gain access to the computer-based network will still be able to tap into SMARTLINE's store of knowledge through their local library or by calling the Department's toll-free information line. Eventually, SMARTLINE could be available in community centers, shopping malls, prisons, and hospitals—wherever learning can happen.

In March 1992, OERI announced another ambitious initiative to integrate technology into our schools: a $6 million competition to support the use of the latest technology in instruction to help students achieve high standards in challenging subject matter. The single, multi-million dollar award would provide sufficient resources to purchase the equipment needed to benefit from the full range of technologies that could be focused on one demonstration site. Such an intensive approach will allow us to assess the full benefits that technology has to offer for improving learning.

As part of its FY 1993 budget request, the Department has requested continued funding of $18.4 million for the Star Schools program. Under this program, the Department has supported telecommunications partnerships providing services to more than 5,000 schools in 48 states, the District of Columbia, Puerto Rico, and the Virgin Islands. The telecommunications partnerships that have produced and disseminated the programs include: Satellite Educational Resources Consortium in Columbia, South Carolina; Massachusetts Corporation for Educational Telecommunications in Cambridge, Massachusetts; Educational Service District 101 in Spokane, Washington; Telecommunications Education for Advances in Mathematics and Science, Los Angeles, California; TI-IN, based in San Antonio, Texas; the Black College Satellite Network in Washington, D.C.; and others.

The services included instructional programming for students and teacher education and professional development. The technologies employed have included satellite, interactive video, cable-distribution, microcomputer-based applications, and facsimile. The students served also vary tremendously, from some in rural areas to others in our largest urban centers. Star Schools beam instruction in math, science and foreign languages to schools where advanced subjects are unavailable. They also promote a model of excellent teaching.

The Department's Office of Special Education Programs, under the Individuals with Disabilities Education Act, has a long and continued history of supporting projects and centers to advance the availability, quality, use, and effectiveness of technology, assistive technology, media, and materials in the education of children and youth with disabilities. Early projects in the 1970's explored the use of telecommunications and computer technology in the education and social integration of students with disabilities. Today, the Office of Special Education Programs supports a variety of research, demonstration, and information access projects.

A $1.5 million "Center to Advance the Quality of Technology, Media, and Materials for Providing Special Education and Related Services to Children with Disabilities" works with developers, publishers, and distributors of technology hardware and software, media, and materials to increase the quality of their products for children and youth with disabilities. This Center is working to combine the considerable resources of private industry and the research community to provide educators with more powerful and multimodal tools for achieving better outcomes with students with disabilities. A parallel center will be funded in FY 1992 to improve the use of technology, media and materials by practitioners who work with students with disabilities.

In addition, the Chapter 1 program, the Department's largest program of educational support to children in high poverty schools, has provided the funding for many of the 51,000 Chapter 1 schools to purchase computer assisted instruction, including hardware, to meet the needs of educationally disadvantaged children. We will continue efforts to improve the quality of the software for these children to better address higher order thinking and reasoning skills in addition to basic skills.

The use of technology to make schools more accountable for results has also been a thrust of Chapter 1. Computer programs have been developed and put in use at school, district, and State levels to track the progress of individuals and of groups of children served by Chapter 1 so that educators, parents and the children themselves can be informed of progress made. Not only has this resulted in reducing paperwork and data burden, but also has produced informative assessment of student performance which is shared and understood by parents and children. Combined with clear goals and objectives, technology allows the status of learners to be assessed and strategies to be reviewed with relative ease.

Chapter 1 has promoted the use of educational technology in schools and provided technical assistance to schools, districts, and States on the uses of technology and the integration of technology with other educational activities to help children learn.

As SMARTLINE-evolves, it will become the first stage of U.S.A. On-Line. U.S.A. On-Line will be the Department of Education's comprehensive effort to provide educational information and instruction to individuals in schools, homes, libraries and workplaces. It will consist of several components, including providing information about education as well as delivering instruction through distance-learning technologies. U.S.A. On-Line, in other words, will eventually evolve into a distance learning system that will enable students, teachers and others to learn at their own pace and at a place of their choosing. SMARTLINE will be a part of the NREN superhighway for educational technology, and many providers—public and private—will use it to disseminate information and ideas.

Technology, and telecommunications in particular, fits well with AMERICA 2000, the President's community- and state-based strategy for education reform. By helping to bring education into the information age, modern technology can help empower localities to take stock of their educational needs and to develop world-class schools that work for all our children. The future of education technology does not rest with a singular approach. It will include a variety of advanced technologies.

Senator INOUYE. Thank you very much, Ms. Ravitch.

In your opening remarks, you indicated that goals should be established. If so, should it be the Federal Government or the several States or the school districts, and if it is the responsibility of the Federal Government, have we articulated any goal as to what we should achieve?

Dr. RAVITCH. Sir, the goals I was referring to were the six national education goals agreed to by President Bush and the 50 Governors. And I know that Governor Clinton was the representative of the National Governors Association at the time those goals were agreed to, so I believe they are bipartisan goals.

My view is that technology is an integral means toward reaching all six goals, the first goal being that children should start school ready to learn. And as I indicated, I believe that we could develop videos that could be shown to young mothers, even as they are in the hospital having just delivered their baby, they could begin at the very beginning understanding how to hold their baby, how to stimulate their babies cognitive and social and emotional growth. I think that every one of those goals can be addressed by the use of technology.

Senator INOUYE. I have many other questions. If I may, Dr. Ravitch, I'd like to submit them to you.

Dr. RAVITCH. Certainly.

Senator INOUYE. As all of us are aware several committees are meeting at this moment. That is why all of the members are not here. For example, Appropriations is meeting, Judiciary is meeting, Finance is meeting at this moment, and I will have to go and do my appropriations work.

Dr. RAVITCH. Sir, I hope you will bear the needs of the Department of Education in mind when you do. [Laughter.]

Senator INOUYE. You will get your money.

And so if I may, I would like to be excused, and I am pleased to call upon Senator Exon to assume the Chair.

Dr. RAVITCH. Thank you.

Senator INOUYE. I will take care of your State. [Laughter.]

Senator EXON [presiding]. That is an inside joke that is going on up here. I do not want to confuse the audience.

The chairman will be back as soon as he can. He does have some important appropriations matter to take care of.

I would just like to say, before I call on the other Members of the Senate who were here this morning, to possibly follow up basically on the question that was asked by the chairman, and I must say to you, Dr. Ravitch, that there are those of us on this side of this table who, time and time again, year after year after year, are the ones who have to follow through congressional leadership. I do not know about the cut that was made that you referenced in the

House of Representatives, but I know that the day before yesterday I appeared before a committee of Labor, Health, and Human Services on behalf of important educational programs; namely, impacted aid, namely, Star Schools that you just referenced, and others.

We cannot do this alone up here. I must tell you that as Assistant Secretary I have been displeased for many, many years with the attitude of the President and the administration to educational programs. So, I am delighted that you are here today encouraging us to rev up some of these programs, which I think are absolutely essential. And I will comment briefly in just a moment on what I see going on in education today.

As a former Governor I think I have a perspective on some of these things that may not be shared by all of my colleagues here. But I just want to ask you the first question: Are you satisfied and have you had input into the budgets, the education budgets, which are partially the responsibility of the Federal Government, in the last budget and the previous budget submitted to the Congress by the President and the Secretary of Education?

Dr. RAVITCH. Sir, I have been in office for 1 year and 1 week, and I fully participated in the preparation of the 1993 budget for my agency in the department. The President's budget request, is about a 57-percent increase for the Office of Educational Research and Improvement, with significant increases for technology and for support of developing standards and a whole range of activities that are very important in education. So, I am very proud to speak on behalf of our budget and I am very sad to say that we have been level funded with a 1-percent cut in the House. I am hopeful that we will do better in the Senate. Because our budget represents very important needs in research and development and improvement. I do not know of any company in the world that can improve its product without R&D.

Senator EXON. Are you as enthusiastic about the whole budget of education presented by the administration as you are about the part of the budget that concerns you—I assume you have not been involved directly in the overall education budget.

Dr. RAVITCH. I am not directly involved in the overall budget. I have been a forceful advocate for my agency and I think we have done very well.

Senator EXON. Do you believe that the Star Schools Program is sufficiently funded in the budget that you approved?

Dr. RAVITCH. The request for Star Schools is about $18.4 million, which is the same as last year. We have been told this is a time of tremendous fiscal stringency, and of course everyone has been urged to make cuts. I am very pleased with Star Schools. I think it is an excellent program.

Senator EXON. Is it properly funded by the Federal Government?

Dr. RAVITCH. So far as I understand, it is, sir. I do think that we need to—I would like to see it grow. I would like to see distance learning grow. But I also think that the initiatives that we have launched this year, particularly SMARTLINE, which would provide a vast array of information and a level field of information, I think that it is very important in a democracy that people have equal access to information, and that is not the case today. And I think that is one of the functions of SMARTLINE.

Senator EXON. Dr. Ravitch, just let me editorialize a moment then. Probably you and I are on the same track. I happen to think that education is being ravished today at all levels of government, primarily, I think, in starting out with the fact that the Federal Government is basically pulling back on its commitments as the Federal Government has on Medicare and other programs, passing any maintaining of the present levels or increase in special innovative programs that you are here promoting, passing those down to the States. The States, in turn, do not have the resources to meet those. They are passing them down to the local levels of government where they fall primarily on the real estate taxes, which is probably politically the most sensitive tax of all.

I just feel that there is a downward spiral going on. By that, I do not mean that the educational establishment itself does not have responsibilities to do a better job than they have in the past in many of these particular areas. But I certainly salute you for being here promoting new and innovative programs for education that I think are absolutely critically important, along with the whole educational program that we are trying to enhance if we are going to be competitive with our students and our young people in the new century which is just around the corner.

Senator Burns.

Dr. RAVITCH. Senator, if I could just respond for a minute. I was asked to join this administration despite the fact that I am a registered Democrat, and I reregistered in Washington, DC, as a Democrat.

I have to tell you, sir, I think that education must be bipartisan, and everything that I have done in my conduct in office has been to promote a bipartisan approach to education. I think that education is much too important to get caught up in any kind of divisive issues, so I certainly agree with the thrust of your remarks and I think that to the best of my abilities I will promote through my agency a strictly, not just bipartisan but nonpartisan approach. I think that the welfare of our children should unite all of us.

Senator EXON. And grandchildren.

Dr. RAVITCH. Yes, sir. I wish I had some.

Senator EXON. Senator Burns.

Senator BURNS. Thank you very much, Mr. Chairman. I do not know whether I am going to get caught up in all this partisan stuff or not.

Dr. Ravitch, thank you for coming this morning, and I guess I would just like to express some of the concerns that I have. I have talked with members of the administration and they sort of conclude what we are seeing, that I have a very high concern about the lack of interagency coordination with respect to programs.

I have a feeling that inside this beltway that we are falling into the trap that has been the failings of any bureaucracy, and I am here to inform you this morning you are behind the curve. There is more happening in this country—they are so far ahead of you that it is unreal.

While we wallow around here trying to develop some programs, they are already there. We do not get out of the way, or we do not put an apparatus in place to coordinate these technologies and how they apply and allow teachers, classroom teachers and programmers to get on with the business of educating our children.

We get an idea back here, or somebody does, that they have got this idea and it is going to take thousands of dollars and millions of dollars to develop it. It is already being done in the private sector, but we have not taken a look at that because it is done and we cannot get—I do not know what the holdup is. I guess we get in turf battles or whatever it is, but we do not have—and it is not going to take any money.

You have got the resources, you have got the people, you have got the offices to sit down and say, "OK, we need somebody or something to coordinate the technologies out there and to look at the policies to let these technologies flow and let the people that are in the trenches make the judgment on how best we educate our kids and the technologies that they want to use."

We just want to make it available, because I will tell you that these technologies are out there, they are ahead of you, but we have no coordination or clearinghouse to say what is there, and how can we best promote? Now, that does not take a lot of money from the Department of Education. You do not have to hire anybody special. You just have to do it inhouse, and if——

Dr. RAVITCH. Sir, excuse me.

Senator BURNS. Yes.

Dr. RAVITCH. I have only lived inside the beltway for a year. I am not a beltway thinker. I find your remarks to be browbeating, but let me say that it does take resources.

You cannot just say we are going to do all these things with neither the resources nor the people to do them, and one of the reasons that the bureaucracy gets weighed down is because—you should forgive me, sir—the Congress has the tendency to create programs and to scatter them all over the Federal Government. I could spend all my time just trying to figure out who has the responsibility for doing things because you do not focus things in one place.

Now, one of the most useful things that I have noticed in my time here—and I think my assistant is saying, probably, calm down. [Laughter]

One of the most useful things that I have seen——

Senator BURNS. My assistant just told me, too, the same thing. [Laughter]

Dr. RAVITCH. Senator Bingaman has proposed within our office an Office of Educational Technology with a board. I think that is a very good idea, because I think it will help to focus the activity in one place instead of scattering it across 6 or 12 agencies, as is the custom, and I think that it will also assure that we can hire somebody who is a national figure to lead this effort.

I think that there are certain roles that the Federal Government should play. One is a leadership role, and I have been trying to play that, but it is really hard to play it when the House says you cannot have the money to do anything. I mean, it is nice to get out and talk, but when people say "What are you doing?" and you say "Well, sorry, we did not get any money this year," it is hard to play that role.

Second, I do think the Department of Education should play a coordinating role. That is an important thing we can do, and we can talk more about that later. Research is a very important Federal role, and nobody has the resources to do it as we should. We had a report out from the National Academy of Sciences this year about the underfunding of educational research over the past 20 years, which showed that it is a very serious problem. We cannot do research without resources.

We have a program of field-initiated studies, only $1 million for the entire country. The National Academy of Sciences says it should be in the area of $100 to $200 million. Again, you cannot develop R&D when you do not have money to do it.

Furthermore, we do not have the people to do our job. Many people in our agency are working three or four different projects because we do not have the S&E to support all the programs that get passed. If they get passed, we do not get the money to hire the people to support them.

Anyway, there are a number of things we can do, but I think those are the key things, but I would be fooling you if I said that we can do it without people and without resources. It is not possible.

Senator BURNS. Then I would ask this. I do not know what Senator Bingaman has proposed on this thing. Do you think it requires legislation, then, to pull together these technologies and to provide a clearinghouse for what is there and the direction we should be going?

Dr. RAVITCH. I do not think we formally need a clearinghouse. I do think the kind of office he suggested will give us the people resources we need. It will also provide the focus and the authority that we need in order to provide the leadership, the coordination, and the steady oversight of the development of educational technology.

I would say at the same time, I do not think it is the Federal role to pick winners and losers, because I think that would probably hamstring the private sector, and in my travels around the country it has impressed me that the rest of the country is way ahead of folks inside the beltway not only on technology but on a lot of other things.

Take, for example, the development of standards and new assessments. It is happening all over the country, and meanwhile Congress is saying well, maybe you should do it, maybe you should not do it, we do not want you to do it, and yet it is happening everywhere. It is happening in the States. They are way out ahead of us, thank goodness.

Senator BURNS. Well, that has not been the case in my office, let me put it that way. If it is going to take some legislation I would be happy to work with Senator Bingaman, because I just happen to believe that I am just—I think somewhere in the Department of Education, without any direction from Congress, could recognize some of the problems, the fragmentation that we have.

Dr. RAVITCH. I recognize it, sir. In terms of technology, I assure you that you have an advocate, you have aggressive leadership. I would be happy to work with you.

Senator **BURNS**. I have no more questions. Thank you, Mr. Chairman.

Senator **EXON**. Thank you very much. Senator Pressler.

Senator **PRESSLER**. Thank you. It is a fascinating presentation. Let me just follow up on one point, for Diane Ravitch.

In your testimony, you mention a program called SMARTLINE. Could you describe this resource, and what schools need to do to access this program?

Dr. **RAVITCH**. Well, what we are doing with SMARTLINE is trying to create it. We want to create a computer-interactive system where teachers can talk to each other across the country, where we can put into this system everything we know about education.

We want to be able to say what is happening, where the best programs are, where the best practices are. If you have something in your community that is the best science program in your State, everybody in the country should be able to access it and find out about it.

Let me let James Mitchell talk about this, because he has been integrally involved in the development of the concept.

Mr. **MITCHELL**. Basically what SMARTLINE is going to be, as Diane did stated, it is going to be a computer-based, on line system that is about improvement——

Senator **EXON**. Mr. Mitchell, would you pull your microphone a little closer to you so the people in the back of the room can hear also? Thank you.

Mr. **MITCHELL**. OK—about the improvement of teaching and learning.

What we plan to do with SMARTLINE is that any parent, teacher, community leader will be able to go to an online system and be able to get access to information such as research results, teacher job data bank, in addition to that, sources of help, a variety of things that we produce inside the Department of Education, as well as things that teachers themselves in the classroom are producing but need a national platform to have in place this year. They are on innovative programs and practices as well, in addition to the ones that come through our NDM program.

Dr. **RAVITCH**. And sir, as I said, we did request funding for 1993, and we are still hopeful that the Senate will be helpful to us in supporting this.

Senator **PRESSLER**. Now, no doubt you have some long-range goals and plans in the Department of Education with respect to advancing distance learning. Do you have a 5-year plan, or a 10-year plan? I do not want to sound like the old Communists, to have 5-year plans, but you must have some goals over the next few years. Would you lay those out?

Dr. **RAVITCH**. Sir, I can tell you that we have a vision of U.S.A. On-Line as the distance-learning system that would reach every home and workplace and school and office in the country and be a source of instruction as well as information.

We have asked in this year for $1 million of planning funds so that we can begin to lay out how we begin to reach the vision. We have no money, no resources, no people to work on this vision. We cannot hire the kind of technological experts that we need to devote their full time to developing how we plan and build this vision.

This last year we were given or directed to conduct a single $6 million competition for a high-technology demonstration, and in the way these things work, it goes out on the street, people find out about it, they apply—well, the way it works is, if you are told that you have 39 or 45 days to develop a plan to spend $6 million, you get a lot of half-baked ideas coming in, because people cannot do something overnight that is going to make sense for a large, long-term program.

So, I think that what we need is we need the startup money to lay the plans to begin to integrate what we do with Star Schools, what we do with the ERIC system, what we do with the SMARTLINE system, and begin to develop toward the long-term vision of a distance-learning system that can reach everyone in this country.

But if you were to give us a huge amount of money and say do it next year, that is not possible and it is not a feasible way to do it. We have not had the money or the resources to develop the plan that you would like to see. I would like to see us have that.

Senator PRESSLER. Thank you very much.

Senator EXON. Thank you, Senator Pressler.

We are just delighted to have Senator Bingaman with us today, who has been a leader in this whole matter of education in a whole series of areas, and he has already been referenced here this morning in testimony with regard to a plan to assist in the enhancement of our new, innovative programs, and I am very pleased to recommend Senator Bingaman for any statement or questions that he has.

Senator BINGAMAN. Thank you very much, Mr. Chairman. Let me compliment Dr. Ravitch for the effort that is being made and the leadership that is being provided on this issue without a lot of resources.

I wanted to mention three things. First, we did earmark some funds in the defense bill that we have reported out this week, out of the Defense Armed Services Committee that Senator Exon and I serve on, to support the kind of thing you are talking about, and I think in retrospect we have probably not done it in exactly the right way.

I do not think it acknowledges the natural and logical leadership role that your office needs to have in any Federal initiative in this area, but we have $20 million earmarked for development of software educational resources, video programs, et cetera, to be used in DOD-related schools, with the idea that they would also be prepared for use throughout our public school system.

The other item we put in was $15 million to support an effort which would be jointly done with the Department of Education to develop specifications for a national interactive educational technology and telecommunications network.

What I would ask is that you look at that language and get back to me here in the next week or so if possible before the bill comes to the floor and perhaps we can revise the language that earmarks it so that we are sure that that is being provided in a way that would allow some of the things that you would like to do to be done, and allow your office to remain in a leadership role in this, because I think it is a logical way to organize it.

Dr. RAVITCH. Thank you, sir. I will get right back to you.

Senator BINGAMAN. All right.

Let me ask you about the proposal that was in the recommendation the Carnegie Commission had in their report called "Ready To Learn." Ernest Boyer I believe headed that group, and one of their recommendations was that we should have a public television network devoted to preschool instruction for young children. Is that something you endorse? Is that something that we need to be funding? What is your view on that?

Dr. RAVITCH. Well, sir, I cannot speak for the Department, because I do not think the Department as such has a position. As a mother and a citizen I think it is a good idea.

Senator BINGAMAN. OK. Let me ask about the Edison project. I am impressed with what I have seen going on there and the quality of people that they have attracted and the commitment of resources, and I guess what strikes me is that we are in a situation where, because of our inability to put public funds into the R&D and development and application of technology and and education we are in danger of seeing that job done in the private sector in a way that does not benefit us nearly as it should in the public school system.

I mean, I wish Mr. Whittle well in his efforts to develop 1,000 schools where he can charge people tuition to come in, and that will be a money-making venture, but there are a lot of folks out there who are not going to be participating in those schools no matter how successful they are.

I guess that my concern is that we do not have something comparable in terms of the level of effort and the commitment of resources in the public sector which holds out the promise of doing the same kind of innovative things in the public schools that he is hoping to do and Time-Warner is hoping to do in the private sector. I would be interested in your comments on that.

Dr. RAVITCH. Two comments. One is that, given the paucity of funding for research within the Department of Education, it is not surprising that we cannot support that level of effort. There is no reason why we should not, but we do not, because research across the board has been underfunded.

But I would second say that the New American Schools Development Corp., which just announced sizable grants for 11 different design teams, will be doing something similar, but not with the level of resources that the Edison project will have. The Edison project is talking about an upfront expenditure of $50 to $60 million to design a prototype school.

Each of these 11 design teams will be developing prototypes. I think this is very encouraging, because from what I have read, they do intend to use technology very differently.

Now, many people will say well, how does this differ from all of the other experimental schools we have had in the past. The difference is that in the past what we have done is to say to existing schools, why don't you experiment in this way or that way, or try something different. These are existing schools that tinker around the edges but when the money stops the experimentation stops.

Where the New American Schools concept is different is they are starting from scratch. There have been very few efforts in the past where anyone said start from scratch and here is the money to do it. In this case, we have some of our best education thinkers in the country at work developing a technologically rich environment for learning, so I think this is an exciting new venture.

Senator BINGAMAN. Are the resources you are referring to that are coming from this foundation private sector funds?

Dr. RAVITCH. The New American Schools Development Corp. money has all been privately raised, because as you know, Congress has not been willing to put any money into that.

Senator BINGAMAN. Well, has the administration asked us for funds for that?

Dr. RAVITCH. Yes, there was a request—not for the foundation, but to support the 535 schools that could then adopt the designs of these new design teams. Hopefully in the future if these design teams come up with wonderful prototypes, Congress might be willing to take a closer look at that proposal.

Senator BINGAMAN. Is there a consistent pattern? Are you suggesting there is a consistent pattern of administration requests for funds for education R&D which the Congress has not honored?

Dr. RAVITCH. Sir, I am only speaking about the year that I have been here. I cannot speak for other years.

Senator BINGAMAN. This 1 year in the——

Dr. RAVITCH. This 1 year, where we have asked——

Senator BINGAMAN [continuing]. In the Appropriations Committee.

Dr. RAVITCH. Yes, sir, very significant increases. We are not thus far successful. I am hopeful still that we will be.

Senator BINGAMAN. But the 20 years of neglect or underfunding that you referred to——

Dr. RAVITCH. It spans across administrations.

Senator BINGAMAN. OK.

Dr. RAVITCH. Practically from the day that the National Institute of Education was created, funding has been held steady, and there has been no increase. In fact, because of steady funding with inflation it has been a dramatic decrease over the years.

Senator BINGAMAN. All right. OK. Thank you very much, Mr. Chairman.

Senator EXON. Senator Bingaman, thank you very much.

Dr. Ravitch, thank you very much for your excellent testimony. I would just like to finish up with a question or two regarding the overall approach to what you are trying to do, and I salute you for what you are trying to do. I frankly believe that you have a perspective on this thing that might be extremely helpful as we move forward.

In Nebraska with the Educational Television Network we have been pioneers for a long, long time in point education, that is from point A to point B, starting out many years ago with the ability of a doctor in a relatively small community without all the resources he needs to be able to directly talk with and show pictures to specialists in the university medical center, for example.

Based upon that we have done a great deal over the years at all levels in Nebraska to try and bring home to the rural communities and the rural community schools not only medical information and education but also basic education, including the preschoolers.

So, there is a whole broad field out here. It is not something that is going to be done without spending some money, but I still feel that we must keep all of this in perspective as we try and move forward.

Let me ask you a question that I have been thinking about for some time, and maybe this is not the time to even think of such a thing, but I suggest with your innovative mind in this area, you may have explored this to some extent.

Do you believe that now or at sometime in the future we might need a separate satellite system in the United States dedicated primarily to education and the types of innovation that you are advocating here today?

I suggested that, if it ever comes to pass, it might be incorporated with what I referenced earlier with regard to medical information back and forth across the country. For example, if some doctor in a small town somewhere in the United States wants to talk with an expert at Johns Hopkins University on some type of a disease or an operation, this satellite system could make it possible.

Do you believe we might need something like that at some time in the future, or do you believe that just pirating off of the other satellites that we have now can suffice as long as we can see into the future?

Dr. RAVITCH. Sir, we did research this in the Department. Initially when we thought about it, it sounded like a good idea, and then we began investigating it, and what we discovered was that there is plenty of time on all of the different satellites that are either in the air now or soon to be launched.

For instance, PBS plans to launch one in the next couple of years, and there are several others that are going to be launched, and what we have learned is that there will be no problem of time, and that the cost of going onto these satellites is going to go down, given the number of them that will be available.

There is also, I think, the realistic problem that the cost of having to have a dedicated satellite is probably far beyond what makes sense today, and it just does not seem necessary. If there were a problem getting time on any existing satellites, it might be a reasonable thing, but as far as we can tell, there is no problem.

Senator EXON. So, what you are saying is that we have the satellite capacity, or will have from what we are planning in the future.

Dr. RAVITCH. We do now. We do now have the capacity, and the capacity will expand, so there is not a need to have a dedicated satellite for education. For instance, the programming you describe, there is no problem getting time for that programming, and our Star Schools people do not have problems getting onto satellites now.

Senator EXON. But the problem, then, is the fact that what we need is more and better types of programs and innovations that you are advocating here today, and the satellite problem will take care of itself as far as we can see into the future.

Dr. RAVITCH. The satellite problem is not a problem, and as I said, PBS and others plan to launch satellites on which there will be plenty of time for education programming. The problem is the quality of the programming that is available, and that is where we should put our focus.

Senator EXON. Thank you very much, Dr. Ravitch——

Dr. RAVITCH. Thank you, sir.

Senator EXON. And Mr. Mitchell, we are delighted to have you here this morning.

Senator BURNS. I have some questions that I would like to submit to you to answer in writing. I think the whole philosophy behind the educational satellite is collocation. We have got programming up there right now, but it is scattered from hither to yon, and that is what I am trying to get at.

There has been no coordination on this, and then I fear that one person standing as the gatekeeper of the accessibility of that limits free access for all of the education community, and that is the thrust behind the EDSAT idea. So, I would agree, there are things up there, but what other people are proposing, they are yes, proposing, but what we can probably get done? So, I have some questions I would like to submit in writing for the record to have answered back to the record.

Dr. RAVITCH. Sir, just two comments I want to make. One is that there is this tremendous growth in compression technology which will soon be, I gather, common and it will quadruple the capacity of existing satellites at a minimum. I cannot get into the technology of it because I do not fully understand it, but I have met with people who have said to me that we are going to see a dramatic expansion of availability even with existing satellites.

The other thing is that one of the ways that the Federal Government could be helpful would be in playing a coordinating role to help some of the educational programmers get together and buy programming in bulk and they could save a lot of money and energy working together. I do not think we necessarily should direct them, but I think we can help them sit in the same room and develop a consortium where they can work together.

Senator BURNS. Keep in mind on compression that we have schools right now that have equipment and it is going to take an investment both on uplinking and receiving to do that, and right now, we have got budgets that will not allow that in most school districts. So, let us not one end all here on that. Just like I say, I want to submit to you some questions and I want those questions answered for the record.

Dr. RAVITCH. Senator, I would be happy to answer your questions, and also to work with you and do whatever we can to achieve what we both want. Thank you.

Senator BURNS. Thank you very much. Thank you, Mr. Chairman.

Senator EXON. Dr. Ravitch, there may be other questions for the record and, if so, we would appreciate your answering everything as promptly as possible so we can include them in the record.

Dr. RAVITCH. Thank you.

Senator EXON. Thank you, and you are excused. We call panel No. 1 now. Mrs. Linda Roberts, Senior Associate, Office of Technology, and Mr. Harry Miller, President of United States Distance Learning Association. We will call those two witnesses at this time which are noted on the official list here this morning as panel No.

1. I have no way of knowing which of you would prefer to go first and then, unless there is a suggestion from the panel as to who goes first, I would recommend that we recognize Ms. Roberts.

STATEMENT OF LINDA G. ROBERTS, Ph.D., SENIOR ASSOCIATE AND PROJECT DIRECTOR, SCIENCE, EDUCATION AND TRANSPORTATION PROGRAM, OFFICE OF TECHNOLOGY ASSESSMENT

Dr. ROBERTS. I would like to thank the committee very much for inviting the Office of Technology Assessment to testify. It has been our pleasure to provide information to the education committees, as well as to individual Members on this committee.

We are very pleased that the report that we completed for Congress has been useful, not only to Congress, but to many of the States and to the local communities around this country who are interested in taking advantage of and using technology wisely. Before I begin, let me just emphasize that when we do our work, we spend a great deal of our time going into the field.

We were in Montana. We visited the Big Sky Network. We were in New York. We sent people to North Carolina, to Texas, and to Oklahoma. We feel very strongly that we cannot know what is happening from our vantage point here, unless we are out in the field, and unless we really do talk with the communities, the educators, the universities, the providers, and the industry to understand what the opportunities and the problems are.

I will be very, very brief in summarizing my report to give you an opportunity to ask questions. Let me first say that telecommunications technologies are growing in importance because they go far beyond the simple broadcasting of information with learners as passive viewers.

Today's technologies bring new resources into the classroom, link learners together in new ways, support teachers, bring the community to the school, and support the community as well. As Senator Burns pointed out, the networks that support education can support business, health, and Government needs in every single community in this country.

Infrastructure for distance learning is composed of many systems. There is no single best technology and most systems are hybrids. While the original impetus for distance learning was to provide high school courses in advanced subjects, as you will hear today in other testimony and as we point out in our report, new, exciting, and innovative uses are emerging and continuing to emerge.

Beyond convenience, telecommunications links offer a greater variety and range of learning opportunities for both teachers and students. Even more, distance-learning systems are bringing new resources to schools in a time of diminishing budgets.

Use of video resources is expanding. Almost 70 percent of schools have some access to cable and satellite channels, and more than 21 percent of school districts use live two-way distance learning.

It is interesting to note also, in light of the previous discussion about SMARTLINE, that 48 percent of the schools have modems for use in the classroom. But despite the explosive growth of distance learning in K–12 education and elsewhere, access to these resources varies nationwide. There are a number of ways that Congress can help expand and improve distance learning.

First, as you have already heard, the education community is worried about telecommunications rates and charges. Solutions could include educational rates for telecommunications, direct grants, and dedicated facilities. Second, as the technology has been flexible, so has the legislation, leading to a rich mix of programs and new partnerships among the States, schools, universities, public telecommunications providers, and the telecommunications industry.

Most noteworthy of this kind of flexibility, Senator Exon, is the Star Schools legislation. It really legitimized the kinds of partnerships and collaborations that we know we have to have and, it seems to me, that Congress needs to keep encouraging these collaborative and cost-sharing efforts.

A third way in which Congress could be helpful is to support quality programming. The emphasis on starting up systems often leaves this critical element to chance. Much can be learned from today's projects as programs are improved and interactivity is increased. I would have to reinforce what we have already heard and say that we must find new and better ways to educate our children.

While there is much that is very effective about today's distance-learning efforts, I am certain that we could do it even better. We could continue to engineer systems that really work for teachers and for students. Finally, teachers must have training and institutional support to successfully use distance-learning technologies as, indeed, they must have for all technologies. Their concerns about technology and the quality of instruction must be taken into consideration in planning distance-learning efforts. Teacher support and teacher input not only shape development, but assure long-term commitment.

The rapidly growing interest in telecommunications in education is due in great measure to the innovative and resourceful efforts of educators, providers and Government officials, and many of those people are going to be testifying later in this hearing. As I have said, much has already been accomplished by tapping into available resources and, at the same time, by creating new systems. Many believe that future applications will contribute even more to learning through improved delivery, greater interactivity, and stronger content. In thinking about the next steps for telecommunications in education, Congress should keep in mind the following points.

Teachers will always be important whether they are the distance-learning teachers or the users of these resources. While technology delivery systems will become cheaper, operational and programming costs will remain constant and will require substantial support.

Finally and, perhaps, most importantly at this point, schools and developers, all the people who want to get involved in this distance-learning game, need information about the growing number and variety of distance learning projects so that they can take advantage of current capabilities, and I believe, design even better approaches for their own communities.

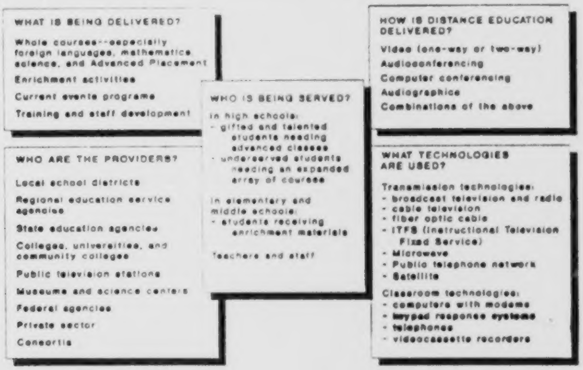
Thank you very much and I would be pleased to answer your questions.

[The prepared statement of Dr. Roberts follows:]

PREPARED STATEMENT OF DR. LINDA G. ROBERTS

Thank you for the opportunity to testify and provide an overview of the role of telecommunications technologies In education. My remarks draw on OTA's assessment of distance learning in elementary and secondary schools[1] and other related work.[2] These studies and our current work,[3] point to the growing importance of telecommunications technologies in education. These technologies are important because they go far beyond "simple" broadcasting of information, with learners as passive viewers. Today's telecommunications technology brings new resources into the classroom. It links learners together in new ways. It supports teachers. It brings the community to the school and the school to the community. The variety of formats, degree of interaction, and types of programming offer many choices (see figure 1).

Distance Learning in Today's Classrooms


WHAT IS BEING DELIVERED?
Whole courses--especially foreign languages, mathematics science, and Advanced Placement
Enrichment activities
Current events programs
Training and staff development
WHO ARE THE PROVIDERS?
Local school districts
Regional education service agencies
State education agencies
Colleges, universities, and community colleges
Public television stations
Museums and science centers
Federal agencies
Private sector
Consortia
WHO IS BEING SERVED?
In high schools:
- gifted and talented students needing advanced classes
- underserved students needing an expanded array of courses
In elementary and middle schools:
- students receiving enrichment materials
Teachers and staff
HOW IS DISTANCE EDUCATION DELIVERED?
Video (one-way or two-way)
Audioconferencing
Computer conferencing
Audiographics
Combinations of the above
WHAT TECHNOLOGIES ARE USED?
Transmission technologies:
- broadcast television and radio
- cable television
- fiber optic cable
- ITFS (Instructional Television Fixed Service)
- Microwave
- Public telephone network
- Satellite
Classroom technologies:
- computers with modems
- keypad response systems
- telephones
- videocassette recorders

SOURCE: U.S. Congress, Office of Technology Assessment, Linking for Learning: A New Course for Education (Washington, DC: November 1989), report brief.

THE SYSTEM TODAY

Transmission technologies have proven to be readily connectable, and the growing infrastructure for distance learning is composed of many systems. Some telecommunications technologies, like educational television, Instructional Television Fixed Service (ITFS), microwave, and cable broadcast have been around for many years. Others, like satellite and fiber optics, are newer. But whatever form of technology is utilized, recent developments have resulted in systems that are powerful and flexible, with hardware that is more affordable (see table 1).

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[1] U.S. Congress, Office of Technology Assessment, Linking for Learning: A New Course for Education (Washington DC: U.S. Government Printing Office, November 1989).

[2] U.S. Congress, Office of Technology Assessment, Rural America at the Crossroads: Networking for the Future (Washington, DC: U.S. Government Printing Office, April 1991).

[3] OTA's current assessment of Technologies for Literacy was requested by the House Committee on Education and Labor and the Senate Committee on Labor and Human Resources and was endorsed by the Joint Economic Committee.

Table 1.—Transmission Technologies for Learning at a Distance

Technology[1]	Configuration	Advantages	Disadvantages	Trends
Terrestrial broadcast	One-way broadcast of audio, video, and possibly data, possible audio return.	No special receiving equipment or converters; reaches most schools and homes.	Limited channels and air time; reception limited by geography; high transmission equipment and production costs.	Increased use of data/text transmission.
Fiber optic	Two-way audio, data, and video	High capacity/speed, channel capacity easily expandable; high-quality signal.	High installation cost; rights-of-way may be required to lay new cable.	Costs are declining rapidly; fiber deployment is expanding rapidly.
Microwave	Two-way point-to-point audio, data, and video	Low-cost transmission line; no rights-of-way needed.	Must be FCC-licensed, tower space or location may be difficult to get, difficult and costly to expand channels; crowded frequencies; line of sight required.	Use of higher frequencies is expanding.
Instructional Television Fixed Service (ITFS).	One-way broadcast or point-to-point audio, data, and video; possibility of audio return.	Low-cost delivery of video	Crowded frequencies, especially in cities; FCC licensing required; limited transmission range; line of sight required.	Digitalization may triple channel capacity; wider coverage areas using repeaters; rebroadcast of satellite-delivered programming.
Public Switched Telephone Network (PSTN)	Two-way voice, limited data and video	Wide coverage; low initial cost; high quality and capacity of fiber optic links; other handle repair and upgrades.	Quality is spotty; limited transmission of data and video; cost is distance-sensitive.	Expanding fiber installation; digitalization of network increasing; increasing intellegence in the network.
Satellite	One-way broadcast of voice, data, and video, possibility of audio and data return.	Wide coverage transmission cost is distance sensitive.	Expensive uplinks; high transmission costs; FCC licensing of uplinks; receive site microwave interference (C-band) or rain fade (Ku-band).	More use of Ku-band; possible transponder shortage; increased use of data; increased interactive capabilities.
Audiographics	Two-way computer conferencing with audio interaction.	Los cost, easy exchange of graphics; uses PSTN.	Visual interaction limited to graphics/still video.	More powerful computers; better software and peripherals increase capabilities.
Cable television systems	One-way broadcast or two-way point-to-point audio, data, and video.	Wide availability, low delivery costs	Limited capacity; can be difficult to interconnect; not usually designed for interactivity.	Capacity increases using fiber; more addressability and tow-way capability.

[1] Technology systems do not have to operate independently; they are often combined in "hybrid" systems.

Source: U.S. Congress, Office of Technology Assessment, Linking for Learning: A New Course for Education, OTA-SET-430 (Washington, DC: U.S. Government Printing Office, November 1989), tb. 3-1, p. 61.

Most distance learning systems today are hybrids, combining several technologies to provide increased flexibility to meet particular needs. Maine's telecommunications network, for example, operates with a hybrid of microwave, ITFS, and fiber optic transmission linkages. The Massachusetts Corporation for Educational Telecommunications (MCET) Star Schools project leverages its limited number of satellite downlinks by working cooperatively with local cable systems to reach more schools. Similarly, the TI-IN satellite-based network has joined forces with Jones intercable and Mind Extension University to offer learners more ways to receive programming.

Technological advances in transmission, processing, and storage technologies are expanding the capabilities of telecommunications systems. Digital compression, for example, will allow satellite systems to deliver up to 16 different channels on one transponder where only 1 or 2 could be delivered before.[4] Satellite providers are also experimenting with VSAT (very small aperture terminal) technology that will allow individual classrooms to send and receive data and video communications.[5] The installation of fiber optics in cable and telephone systems Increases their capacity to serve a variety of needs, including distance learning networks.

The growing telecommunications infrastructure Is supporting new communities of learners. Electronic links In education are literally creating new neighbors among schools, classrooms, teachers, students, and other members of the community. Applications cut across levels (e.g., K-12 and higher education) and go beyond the four walls of the traditional classroom. Students from 3 cities, 3,000 miles apart, come together to study global warming issues; the Franklin Institute is their classroom.[6] in Vermont, 30 adults study science for the GED exam, at 6 different locations connected to the Vermont Interactive Television Network. instead of having to work alone in their homes, they learn with people who have common needs, and get to use high technology, too.[7] Teachers, also have opportunities to work with their colleagues on Issues of common Interest over a computer network or on at a monthly two-way video hook up via cable.

In K-12 settings the initial impetus for distance learning was to provide high school courses in advanced subjects,[8] but new uses are emerging. These important course needs are continuing to drive development of systems. Once in place, however, distance learning systems are being used to take electronic field trips, participate in special events, and offer teachertraining and staff development.

The North Carolina/Southern Bell pilot project is one example. Participating high schools use the network to offer Spanish II, French IV, Latin II, Pre-Engineering, Physics, and Law and Justice. Team teaching physics and law from two different locations is no problem. At the same time, the links to universities make it possible to offer courses and seminars for teachers, administrators, and health professionals, and a drug education program for parents. Beyond this, the system supports multidistrict school board meetings, statewide agency and interagency discussions, and visits with special guests to the community.[9]

The same telecommunications systems that bring resources to students can bring needed training and staff development to teachers and administrative staff. Once all the Dallas schools were connected and wired to receive cable (at a cost of several million dollars to the Dallas independent School District), the telecommunications system became the most efficient and preferred way to reach and involve school personnel. Programs range from a town meeting discussion of the district's dress code (this involved both students and teachers) to a semester-long seminar on site-based management, or a one-shot national teleconference on technology for special education.[10]

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[4] The National Technological University (NTU), a university network that offers science and engineering education and technical training from 40 Institutions, used 2 transponders to deliver a total of 4 channels of analog programming. in converting to a digital system, they will need only 1 transponder to deliver up to 12 channels of digital programming. The second transponder will no longer be needed by NTU and will likely be available to other users.

[5] The Public Broadcasting Service VSAT Pilot will begin in fail 1992 and will use a VSAT network to link students and teachers to other classrooms, libraries, museums, and resource databases. in one phase of the project, classrooms will be paired around the country and students will participate in an electronic forum on the 1992 presidential election. Students will write about the issues, share research, and debate via computers linked to the VSAT network. Molly Breeden, Public Broadcasting Service, personal communication, July 14, 1992.

[6] On May 11, fifth and sixth graders in Dallas, New York, and Philadelphia traveled via the Black College Satellite Network (and their local cable systems) to the Franklin institute's Greenhouse Earth project. They explored global warming issues with scientists on site and students in selected classrooms, and took part in a "live" survey on ways to ease global warming. Bernard Solomon, director of Television, Radio and Audio Visual Services, The School District of Philadelphia, personal communication, June 2, 1992.

[7] Judy Hastings, director, Vermont Interactive Television, personal communication, May 8, 1992.

[8] Distance learning could solve the problem of courses not being available because of too few students in any one school or a lack of teachers trained to teach them.

[9] Bob Freedman, director, External Affairs, Southern Bell, Charlotte, North Carolina, personal communication, June 10, 1992.

Beyond convenience, telecommunications links offer a greater variety and range of learning opportunities for both teachers and students. Even more, distance learning systems are bringing new resources to schools In a time of diminishing budgets.

LOOKING TO THE FUTURE

Use of video resources is expanding. Recent surveys indicate that some 60 to 70 percent of schools have some access to cable and satellite channels.[11] Use of live, two-way distance learning is reported in fewer than one-quarter of all school districts (21.3 percent in the Corporation for Public Broadcasting survey and 22.5 percent in the Market Data Retrieval survey).[12] Despite the explosive growth of distance learning in K-12 education, access to these resources varies nationwide. The majority of teachers and students have yet to realize the benefits that distance learning can provide.[13] There are a number of areas where Congress can help expand distance learning to all communities, sustain the Installed systems, and Improve educational effectiveness.

The education community is worried about telecommunications rates and charges. Although transmission systems are continuing to expand capacity (e.g., digital compression increases the number of channels that can be transmitted over a single satellite transponder, and digital switching/fiber optics increases telephone network capacity), providers and users of distance learning services face many uncertainties. The North Carolina project cited above is an example of this concern. During the experimental phase, the costs of transmission are being absorbed by the telephone company. But what will it cost to the operate the system once the experiment is over? At this point, no one really knows. The education community and industry partners are hopeful that a solution will be found to satisfy both educational and commercial needs. They believe that State and Federal policies will ultimately determine the costs.

There are precedents for establishing educational rates for telecommunications as well as providing direct grants or subsidies. Expectations for increased use of telecommunications networks have spurred proposals to create educational rates for telephone and satellite services. Additionally, there have been proposals to increase educational access to satellite transponders by using a broker to aggregate educational needs and obtain better rates, and by subsidizing the costs. There have also been proposals to set aside cable channels for educational use.

Partnerships between government, schools, and the private sector will continue to be important. The Star Schools Program, other Federal programs, statewide initiatives, local efforts, and projects supported by telecommunications industry have all contributed to the growth of telecommunications in education. One of the primary goals of the Star Schools legislation—to create multistate, multi-organizational partnerships In education—has been realized. OTA suggests that the real strength of these programs has come from these collaborations, producing a rich network of expertise and ideas, collaboration between the public and private sector, and mechanisms for cost-sharing.

Beyond the specific efforts of Star Schools, Federal support of telecommunications has been important in other ways. The Public Broadcasting Service (PBS) has greatly expanded its efforts beyond broadcasting services and is itself involved in the delivery of distance learning resources. With new satellite capacity and advanced technological capabilities, public and private broadcasters could work with distance learning projects in collaborative arrangements. The Public Telecommunications Facilities Program in the Department of Commerce could also be encouraged to support partnering efforts between public schools and higher education, between government agencies, and between the public and the private sector.

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[10] Dianna Radspinner, coordinator for Cable Communications, Dallas Independent School District, personal communication, June 4, 1992.

[11] See Corporation for Public Broadcasting, Study of School Uses of Television and Video: 1990-1991School Year (Washington DC: 1992); and Market Data Retrieval, Education and Technology 1991: A Survey of the K-12 Market (Shelton, CT: 1991).

[12] Ibid.

[13] The Corporation for Public Broadcasting (CPB) survey estimates that two-way distance learning systems are available and used by 8.9 percent of all teachers. CPB, op. cit., footnote 11, p. 11. The Market Data Retrieval (MDR) survey found that interactive distance learning systems reach 5 percent of schools. MDR, op. cit., footnote 11, p. 4.

At the local and State level, the availability of existing resources and formation of partnerships will continue to be critical for the development of distance learning systems. In Cedar Rapids, Iowa, the Kirkwood Community College offered its microwave system and expertise to the local school district; no investment in technology was required to expand courses in the high school curriculum. The Connecticut system combined a grant from the State education agency, technology supplied by Southern New England Telephone, and investment by local school districts. Recent efforts of the Cable Alliance for Education is increasing schools' access to cable. In New York City, a test of the commercial telephone fiber network is a joint effort of the Department of Telecommunications and New York Telephone. The pilot project will enable three high schools, the City University of New York, the Lincoln Center, and the Department of Corrections to experiment with both education and government services next fall.[14]

Quality programming and effective use of technologies for interaction will be needed to take advantage of the capabilities of the technology. A key aspect of using technology effectively is knowing what works and what is available. Information on programming, technical assistance in the design of systems, and training in the use of distance learning technologies are ways that assistance could be provided.

The diverse mix of projects and technologies offers a rich ground for experimentation and research. Most resources go to building the systems and getting off the ground. Quality programming requires an investment in teachers and curriculum development that is all too often left to chance. What could be learned from the teachers who are teaching Russian, Japanese, Chinese, Spanish, French, and German over distance learning systems (some with as few as 15 students; others with as many as 1500 students)? How do they assure that their students are learning? What techniques and materials have they developed to engage students and foster language competence? Answers to these questions and many others could contribute to improved instruction.

Teachers must have training, preparation, and institutional support to successfully use distance learning technologies, as Indeed they must have for all educational technologies. Also, their concerns about technology and the quality of instruction must be taken into consideration in planning distance learning efforts. Teacher input not only shapes development, it assures long-term commitment.

CONCLUSION

The growing interest in telecommunications and education is due in great measure to the innovative and resourceful efforts of educators, telecommunications providers, and government officials. Much has already been accomplished by tapping into available resources and by creating new systems. Many believe that future applications will contribute ever more to learning through improved delivery, greater Interactivity, and stronger content. In thinking about next steps for telecommunications in education, Congress should keep in mind the following points:

- teachers will always be important, whether they are the distance learning teachers or users of these resources;
- while technology delivery systems will become cheaper, operational and programming costs will remain constant and will require support; and
- schools need Information about the growing number and variety of distance learning projects in order to take advantage of current capabilities and to design even better approaches for their own communities.

Senator EXON. Thank you very much, Dr. Roberts. Before I recognize Mr. Miller, I would like to say that if it has not already been done, that all of the written statements by all of the witnesses before the committee today will be included in the official record without objection, and that is so ordered. We appreciate very much the statements that are made summarizing those statements for purposes of brevity and getting to the important question and answer session. Mr. Miller.

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[14] Kendall Guthrie, policy analyst, Department of Telecommunications, City of New York, personal communication, June 9, 1992.

STATEMENT OF HARRY R. MILLER, PRESIDENT, UNITED STATES DISTANCE LEARNING ASSOCIATION

Mr. MILLER. Thank you. It is a pleasure to represent the United States Distance Learning Association before you this morning, which is a national association with its principal goal of promoting distance learning and the infrastructure that it will require.

My role here today is going to be to talk to you, I think, about three very important trends that USDLA has observed as distance learning has expanded and not to go into tremendous detail on the specific applications that are being developed around the country, since you have some of the most experienced practitioners in the Nation here that will speak to you later today.

Before I start on what I consider to be three key points, let me start with a definition, because I think if there are 100 people in this room, there are probably 120 definitions of what "distance learning" means. The USDLA has devised something that at least allows us to construct conversations around distance learning that will describe "distance learning" as electronically mediated conversation between members of the learning community.

It is very clear that since Socrates, that effective education has relied on the conversation, experience, and debate between students and teacher-facilitators.

Electronically mediated conversation allows a new dimension to that debate which is the fact that it can be real time, such as in an interactive television broadcast, or a conference call. Or with electronic storage, you can have a time-delayed conversation much like you would have through electronic mail or through voice mail, which enables not only distance learning to deal with the issue of space and geography, but also the issue of time.

The three key points that I would like to leave you with this morning are some that you have already heard. One is that all technologies work to provide distance learning and, in fact, the most effective systems are hybrid. So, you have the simplest technologies, telephones and radio broadcasts, as well as highly sophisticated fiber optic interactive systems, and they all have their individual applications in some places where they work better than others.

I would point out that one of the most glaring deficiencies, I think, in American schools today is the lack of simple telephone technology at the teacher's desk. That very simple device can bring in significant expertise and dialog between communities and the teachers and students in classrooms.

The second major aspect, I think, that you need to consider when looking at distance learning is that it has already proven its tremendous worth in expanding access to programming and, thereby, improving equity amongst school children all across this country. We have heard a lot about STAR schools providing Japanese-language programming, or students taking physics from a faculty member located in a different location, and I think there is just no question that these programs are effective. Students learn at least as well, if not perhaps better than they do in traditional instruction.

I think the third point, however, is the most important. That although we have expanded access and equity, what we have done is only incrementally improve essentially what we have been doing for decades. Although we are able to bring an instructor live to a classroom, that essentially is the same instruction that has been going on in this country for 20 or 100 years.

Fundamentally, I think, the Congress and the Nation has recognized that we really need to systemically reform education so that we do not lecture to students, but we involve them in the learning process, and there is the greatest potential for distance learning. Distance learning has the ability to support and enable systemic change in education and allow new learning communities to form that did not exist in the past, so that teachers are no longer the only enabler of students as part of the learning process.

Let me give you just one example of that. I am sure you will hear others later on today. This is a program that is in development in Vermont where I reside and it is one called, Vermont's Students in Public Policy. Around Vermont, 18 teams will be formed. Each team will work with a lead teacher. Those teachers will be in different schools and the teams of students will be from different communities.

So, although the classrooms will exist, there will not be a teacher in a brick-and-mortar classroom with 18 students. Those students will be spread throughout the State. Each of those teams will be working on a public policy issue to be debated in the Vermont legislature in the spring term. Those teams will also be linked electronically so they can communicate with each other, do research in their communities on the issues their local communities feel about those legislative agendas.

Additionally, the Legislature in Vermont has agreed to put one of the legislators on that team, so each team will be actively involved with one of the members of the committee. Finally, this project amongst eighth graders will conclude when the teams present testimony formally before the legislature, before the close of the term. I suggest to you that that aspect of distance learning is one that is going to revolutionize the way schools are taught and the way students have access to material, and totally change the nature of the learning community and broaden its scope.

There are two areas I would suggest that you look at. The USDLA has an elaborate policy paper that suggests 15 areas that need to be addressed. I would like to focus quickly on just two of those. One is the need for national demonstration sites. Since teachers cannot typically intuit how to use this new technology in new and effective, exciting ways in their classrooms, they need to go someplace where they can see other experienced practitioners actually using the technology in a living laboratory, rather than in a museum setting.

Second, in the future, we think we all agree that the future delivery mechanism will be one of mixed media, of image, voice and data, and that ultimately we will need broadband facilities in order to provide that kind of programming. Certainly, I think, the Congress can take some leadership in providing incentives to make sure that that bandwidth is available to schools in the near future. Thank you.

[The prepared statement of Mr. Miller follows:]

PREPARED STATEMENT OF HARRY R. MILLER

My name is Harry Miller, and I am the President of the United States Distance Learning Association (USDLA). The principal objective of the association is to provide national leadership in promoting distance learning and the advanced telecommunications infrastructure it requires. founded as a non-profit association in 1988, the USDLA represents over 700 individual, corporate, education and association members. Members represent K through 12, higher education, continuing education, corporate training, equipment and transport providers.

My knowledge of current applications and the future potential of distance learning comes from three years on the USDLA Board of Directors and fifteen years of practical experience at high school and college levels. I was the Academic Dean at Vermont Technical College for five years where I founded Vermont Interactive Television (VIT). VIT is a statewide two-way video network used for instruction and teleconferencing. I am currently employed by New England Telephone Company where a large portion of my time is spent with educational reform activities in Vermont.

I hope to leave you with one message. Distance Learning works! It has clearly demonstrated its' potential to expand educational access and equity, improve student and teacher performance and, most importantly, to act as a catalyst for systemic change. Distance learning removes barriers of space, time and location and brings expert resources to the classroom, supplementing or replacing the dated, non-interactive material used today. We can restructure our schools. We must if we are to realize the nation's education goals and maintain our economic competitiveness.

Distance Learning, educational technology and telecommunications are widely used terms that often mean different things to different people. The USDLA defines Distance Learning in broad terms:

> Distance Learning is electronically mediated asynchronous or synchronous conversation between members of the learning community.

Since Socrates, effective education has relied on conversation, experience, and debate between students and teacher facilitators. Conversation may be "synchronous" as in conference calls or "asynchronous" as in electronic mail. Conversations will be among all learners; who we have traditionally called students, teachers, parents, employers, community leaders, young and old. With that construct, let me illustrate key themes to support my contention Distance Learning works.

ALL TECHNOLOGIES WORK

Distance Learning today takes successful advantage of POTS lines, satellite transmission, compression algorithms, computers, fiber optics, television and text. Tomorrow, discreet audio, video and text sources will merge as mixed media because it most closely resembles the primary constructs of human conversation—the conversation as well as the object of the conversation. Transport technologies will need to be broadband to support mixed media conversations, while still supporting today's applications.

EXPANDED ACCESS AND EQUITY

Distance Learning removes artificial barriers of space and time, thereby expanding both access and equity. It allows teachers to come to students from across the nation or the school next door. Star Schools and other distance learning initiatives have brought instruction to thousands of students who would have otherwise missed opportunities for physics, advanced math, and foreign language courses. Teachers have access to professional development, engineers and scientists to advanced degrees, and the list goes on and on.

Equity is expanded by providing all learners access to similar resources; on-line libraries, journals, content experts, and other learners with similar interests. Learners are no longer disadvantaged by their location.

Equity is also improved because distance learning allows teachers to customize instruction to meet individual learning styles. Students have access to conversation that best suits their needs and enables them to take a more active role than is traditionally afforded by the lecture paradigm.

CATALYST FOR SYSTEMIC CHANGE

The most exciting and expansive role for distance learning is the ability to stimulate systematic reform; vastly improving the performance of both student and teacher. While expanding access is crucial for educational and economic vitality, it will only incrementally improve the status quo. We can do what we do today better but in much the same way as we have always done it. Because Distance Learning removes the physical constraints of traditional classrooms, it enables new learner communities to form. These communities are increased in diversity, scope and levels of interactivity. In short, a vastly improved conversation.

Collegial dialogue is greatly enhanced, allowing teachers to share and debate new teaching strategies. The order of magnitude changes required of our schools will not occur because of technology, but will be enabled by it. Such systemic change will require significant, long term commitments of time, energy, and resources from teachers, students, parents, administrators, business and government leaders.

The variety of technologies, their ability to expand access and stimulate change should make distance learning a focus for federal and state leadership. There are, however, significant barriers to using these powerful new tools. Today's education, communication and information policies were developed long before the advent of distance learning technology. These digital technologies have blurred or eliminated traditional instructional boundaries.

Change must occur in virtually all aspects of our current educational and telecommunications systems simultaneously. I hope the federal government in partnership with state and local jurisdictions will consider the fifteen recommendations of the USDLA policy report developed last summer (Appendix A). Our recommendations were developed with the help of ninety experienced practitioners representing thirty-three states. These leaders debated the changes in education and federal and state policy needed for the 21st century. The resulting recommendations were overwhelmingly endorsed by forum participants and unanimously approved by the USDLA Board.

I would ask that two recommendations be carefully considered in light of limited resources.

- Develop national demonstration sites for educational technology and distance learning that disseminate research results, educational applications and effective teaching strategies.

Practitioners need access to living laboratories to observe master teachers interactions with students in the new instructional settings afforded by technology. Often the potential of distance learning, particularly as an agent of systemic change, cannot be described or intuited—it must be observed.

- Provide incentives for telecommunications carriers to provide dynamically allocated broadband service to schools, libraries, and other learning sites.

As applications evolve to mixed media conversations, we must ensure that learning sites can access the broadest range of resources when they desire at cost effective rates.

I hope you and your colleagues will give consideration to these and other issues raised in our policy paper. Many do not require additional federal resources. If our recommendations are acted upon as a whole, the entire learning community will benefit and the consensus needed to sustain the complex change process required can be achieved.

Thank you for the opportunity to express our views. The USDLA pledges our continued commitment and resources to aid your deliberations.

USDLA NATIONAL POLICY RECOMMENDATIONS

INTRODUCTION

The United States Distance Learning Association is a non-profit association founded in 1988 to promote the development and application of distance learning in education and training. Among the association's constituents are organizations involved in K through 12, higher education, continuing education, and corporate training.

The principle objective of the association is "to provide national leadership". It was in this leadership role that USDLA convened a National Policy Forum in July 1991 in Burlington, Vermont.

Ninety individuals representing 33 states and numerous organizations attended the three-day meeting, including leaders of the distance learning field.

What follows is the set of recommendations from that meeting. These were endorsed by the Board of Directors of USDLA and subsequently approved by an overwhelming majority of the attendees.

THE PROBLEM

The early 1980's found the country in a severe recession. We were deeply concerned about our economic future. Many Americans were persuaded that our economic prospects were dim as long as the quality of education continued to decline.

A litany of private and public studies and reports documented the decline and offered a vast array of solutions.

The early 1990's find the country again slowly recovering from a recession. While there has been much debate, there has been only scattered success in restructuring and improving America's schools. Many now recognize that the decline of our educational system at all levels from K-12 through higher education, is only one of many areas of growing concern in our economic infrastructure. The nation's highways and railroads, water and waste systems, communication networks, education and corporate structures all represent areas requiring attention if we are to meet the challenges and global competition of the 21st century.

The global economy of which we are a part is information driven and operates at a pace in excess of our prior experience. A new understanding of the infrastructure standards necessary to support the kind of information based work force our nation must have is required. The new infrastructure requirements challenge the most basic premises of the American economic system.

Our current infrastructure developed the world's most productive economy. Our success was based on a national communications system unequaled by our competitors, mass production techniques that made it possible to employ modestly skilled workers to produce high quality, inexpensive goods in large volumes, and a transportation system that was fast and efficient. Today, communications and transportation systems are more competitive worldwide, and workers in other nations are willing to work longer hours and for lower wages than their American peers. We can continue to compete in this manner, but only at existing global wage levels with a corresponding massive decline in our standard of living; or we can revise our view of the market and the role of the worker.

High wage level societies will be those based on the use of highly skilled workers backed by advanced technologies and with ready access to a deep array of knowledge bases. Economic advances will be dependent upon improvement in intellectual rather than manufacturing productivity. In order to compete we must rebuild our economy to match the needs of the information age.

This restructuring is clearly linked to economic success and it depends on a strong education system. Redefining our national resources is not only necessary to prepare Americans for work but, even more importantly, to prepare them as citizens in a self-governing society. We must provide access to a shared cultural and intellectual experience to enable citizens to make informed judgments about the complex issues and events that will characterize the 21st century. The cost of not doing so may be more than a decline in our standard of living, it may also cause erosion of our democratic tradition at an unprecedented time in history when the world is moving closer toward the democratic model. We cannot fail in our leadership now.

The critical natural resources of the information age will certainly be education and access to information. While the nation cannot ignore the pressing problems of health care, environmental waste, or decaying cities, we must create a national vision that will focus on the long term economic health of the country. Without this we will not have the resources needed to combat the myriad of problems facing us in our increasingly small world. A new national vision must recognize the interdependence of education, information access, and economic development. One without the others will not produce success.

THE OPPORTUNITY

The United States Distance Learning Association represents universities, K-12 schools, and corporate training interests in an association of over 500 members, and is uniquely suited by purpose, membership, and experience to help articulate a new vision for responding to these new information age core infrastructure needs. Thus, when we called-upon distance learning leaders from all over the nation in July of 1991, for our National Policy Forum, we were able to gather together some of the most experienced practitioners in the U.S. to help us explore policy issues.

Distance learning facilitates high performance education by encouraging new instructional techniques and by allowing electronic access to information from any location. Educational technology, in class or at a distance, is beginning to have a profound impact on the organization of schools, the way students are taught and coursework they can access. It is not only an educational tool, but also a driving force behind restructuring efforts in member organizations. Many successful corporations and schools have already reorganized with technology in mind to capitalize on its potential as a problem solving and information leveling device.

Many of our members represent national leadership in distance learning and their institutions do things differently to accomplish better results, often at the same or less cost. Recognizing the many demands on our national resources, educational technology can be the key to improving student and teacher performance while maximizing the use of resources. While in no way a replacement for the teacher, distance learning can cost effectively bring rare and traditionally expensive specialized resources to the classroom. Distance technologies can expand teaching resources to include practicing scientists, business people, government leaders, health care specialists, parents and seniors and that helps to involve students. The restructured school must bring these resources to the classroom and substantially supplement or replace the dated, non-interactive material used today if we are to realize the goals of "America 2000" as set out by the President and Secretary of Education.

That students learn in a variety of ways is an accepted fact. Yet, most instruction today uses group lecture techniques that fit the learning styles of only a few. Educational technology allows teachers to customize learning and to move toward individual and small group collaborative learning. These are the very skills needed for high wage earner societies hoping to compete in a global economy.

Distance learning might better be described as personal learning for it removes the barriers of space, time and location. Since Socrates, effective education has relied on conversation and debate between students and teacher facilitators. Personal learning technologies facilitate both through a wide variety of resources. Interactive dialogue can happen via interactive television, conference calling, or computer electronics. Delayed dialogue can happen via voice or electronic mail. No one technology, delivery system, or mode of dialogue is best suited to meet all student needs.

The ubiquity of all distance learning technologies will ensure that we can reach all individuals regardless of their location, learning style, or when they are available to learn.

THE BARRIERS

There are, however, significant barriers to using these powerful new tools. Today's education, communication and information policies and regulations were developed long before the advent of distance learning capability. New technologies, particularly computers and digitally processed and transmitted information, have blurred or eliminated institutional boundaries in the once discrete world of voice, image, and video. New policies must be put in place that remove these barriers so the nation can realize the benefit of distance learning.

THE RECOMMENDATION

To defame these new policies, the USDLA recently convened a National Policy Forum. Over ninety leaders in distance learning representing educational and corporate distance learning providers and users, equipment and transport providers, and federal and state policymakers convened to debate the changes in education and communications policy needed for the 21st century.

The recommendations that follow represent their concerns and were unanimously approved by the USDLA Board of Directors as representing the interests of our membership. They encompass both education and communications policy, the inexorably linked cornerstones of our new economic infrastructure.

In order to accelerate and fulfill the tremendous potential of distance learning and educational technology, federal, state and local government should:

1. Develop a vision for a national infrastructure recognizing the critical importance and interdependence of systemic educational reform and advanced telecommunications services.
2. Bring coherence to educational technology and distance learning funding and focus those resources on educational restructuring projects. All future education initiatives or policy should include distance learning as an option.
3. Develop national demonstration sites for educational technology and distance learning that disseminate research results, educational applications, and effective teaching strategies.
4. Provide incentives for teacher training institutions to restructure pre-service and in-service programs recognizing the importance of communication and information technologies.
5. Provide incentives for regional and professional accreditation associations to recognize and encourage appropriate uses of distance learning technologies.
6. Ensure that financial aid programs recognize distance learning as a peer to traditional course delivery.
7. Address educational use via distance learning technologies as an issue for special attention within copyright laws.
8. Provide incentives for states to remove barriers to distance learning around teacher certification, textbook adoption, and acditation practices.

9. Provide incentives for faculty who maximize resources and achieve quality instruction through use of appropriate educational technologies.

Recognizing that all forms of advanced telecommunication services are critical to supporting distance learning and educational reform, federal, state, and local government should:

1. Facilitate the development of a broadband educational network utilizing the public network with an open system architecture and guarantee equal access and governance responsibilities for all educational constituencies.
2. Provide incentives for telecommunications carriers to develop special pricing for educational applications.
3. Provide incentives for telecommunications carriers to provide dynamically allocated broadband service on a common carrier basis to schools, libraries, and other learning sites.
4. Remove the regulatory and business restrictions on telecommunication carriers for distance learning and educational applications.
5. Maintain "set asides" for educational applications in "RF" frequency allocations.
6. Provide incentives to ensure adequate, cost-effective access to satellite transponders for educational applications.

Restructuring American education, like all systemic changed will require significant, long term commitments of time, energy and resources from teachers, parents, students, administrators, business and government leaders. change must and can occur in virtually all aspects of our current educational system simultaneously. Each recommendation will affect all of the learning constituents in some way. Acted on individually, their implementation will affect each constituency differently and the reform agenda will be undermined. If acted on as a whole, all of the learning community will benefit and the consensus needed to sustain the complex change process required for restructuring can be achieved.

Senator EXON. Mr. Miller, thank you very much. We will begin the questioning at this time. First, I would like to ask both of you what knowledge you have, if any, on the question I am about to ask, and it may also be that this question can be addressed by other members of the succeeding panels that will come before the committee this morning.

This morning I think we have all basically recognized this exciting new development. Frankly, I have been amazed to see what I recall as an amazing difference between our children and when they went into the first grade, and our grandchildren as they go into the first grade, with regard to some basic educational functions.

I attribute that primarily to television, which our young people today are mesmerized with from the time that they can first understand. That seems to me to be sending us a signal that here is something that maybe we have not taken full advantage of. In my business career, before I was involved in Government service, I was in a business that helped initiate the viewgraph proposition in schools and in businesses for dispensing information with transparencies.

We had some initial resistance from the schools in this, but then it became very, very popular and today, you see viewgraphs of one type or another used a great deal. This is only a minor step forward with regard to the great new field that television and point-to-point communications and discussions. Expanding on that, it just seems to me like there is almost an unlimited ability that we must seize if we are going to have the type of educational system that we want in the future.

A part of this all comes back, though, to the classroom teacher. The classroom teacher, I think, should not be worried or challenged about the fact of innovative new concepts. The quality of education, by and large, always comes right back to the quality of the teacher or the professor that is putting out the information to the students that have come there from the time they are 5 years old to until they are 25, or 55, or 75 or 85, seeking more education.

My question to you is, from your knowledge in this area and the research that you have done—and you, Mr. Miller, with being involved in the private enterprise system and working in this whole area—do you believe that our teachers through our teacher colleges, and the training that they receive before they become teachers—do you believe that they are properly trained or educated during their educational process to become a teacher, to use distance learning techniques that many of us think will be a great assistance to them, the teachers, and the students that they teach?

How far along has the education system of our teachers come in explaining to them and educating them on this new technique rather than considering it as a challenge to the teachers?

Dr. ROBERTS. I think you have identified a very critical issue. In fact, Senator Burns raised this issue before. It is very clear to us in the studies that we have done, looking both at use of computer and related technologies, and more recently, telecommunications technologies, that by and large most teachers come to the classroom underprepared to use technology as a resource. There are many reasons for this. Most notably, colleges of education are often last in line to have access to telecommunications and computer resources.

Many of the people who are role models and the teachers of the new teachers themselves do not use the technology. While there are some notable exceptions to teacher training programs around the country, I think, by and large, this is still a major problem. But I would also point out to you that most of the teachers who are using technology today are going to be using it tomorrow, and are already teaching in our schools.

While we were able to identify some very exciting ways to help teachers use technology and appropriate those technologies and integrate them into their teaching and into their classrooms, the amount of resources that are made available for training and support of teachers is very, very limited. Most of the time, teachers are expected to learn how to use these technologies largely on their own time and through their own efforts. No corporation would bring new technology in and say to its employees, now take this home and learn how to use it.

Mr. MILLER. I would agree completely, that with the exception of some sort of champion institutions at the higher education level that have really sort of started to take a leadership role in bringing training on using the technologies to the classroom, what you unfortunately see, however, is even in those institutions, they do not use the technology internally, and the best way to demonstrate the effectiveness of a tool is to use it yourself. Then, those people who are training with you will observe that and say, gee, that is consistent, useful practice.

If it was appropriate for your delivery of instruction, it is appropriate for mine. So, I think there is a long way to go in teacher training programs. But as Linda suggested, the large number of teachers that are out there today need substantial support and I think that is why we have suggested the need for national demonstration sites, where actually teachers can go and talk to a peer who is using this.

Let us identify the champions that exist who have created the exemplary programs you will hear more about this morning, and let other teachers interact with them, spend some time with them so that they can not only learn how to use the technology, but also learn how do you use this as a tool to change the way you have traditionally approached your classroom instruction.

Dr. ROBERTS. The systems, the networks that are in place, whether we are talking about computer networks or talking about satellite-delivered instruction or the more local fiber optic and cable networks, are themselves resources for reaching teachers and providing them with training and support.

And a number of districts—I give an example in my testimony of the Dallas district's use of their cable system—are discovering that in some ways this is perhaps the most effective way to bring teachers into the education change process, and that the technology itself not only becomes something you want to use, but it becomes a tool for professional development of teachers.

Senator EXON. Let me just say, as I referenced earlier, the State of Nebraska has been a leader not only in public television but with nationally recognized statewide public education television networks that have been in place for some time. But we are not resting on our oars; we are trying to do more and now satellite education is being accepted there very readily.

In Lincoln, NE, AGSAT, A-G-S-A-T, provided programming to the Nation related to agricultural education. Niscola in Omaha provides foreign language news and educational programs to high schools, colleges, universities, and government agencies.

Both of these systems are remarkable and have been proven that they work very effectively. The problem is a constant battle for adequate funding. Do you have suggestions about present funding sources? I suppose you are going to say they should be increased. [Laughter.]

But I also want to know have private foundations been tapped or private foundations been up front with regard to supporting satellite learning?

Mr. MILLER. I think there is a—the USDLA has produced annually a guide to funding which lists all—a huge array of both private sector and public sector opportunities for schools to get some start-up money for technology-based projects.

And I do not think necessarily that there is a need for more money. I think that more money certainly can be used, but I think the Secretary was right this morning, that it has to be used appropriately. And that if it goes too quickly, you will have inappropriate applications.

And some of the earliest applications of technology in the classroom, in fact, are one of the reasons we do not see it there today. The earliest advents of computers in the classroom were largely drill and rote type materials. Teachers were unprepared for their use, and so a lot of faculty got turned off to the potential that technology would have.

I do think there is a couple of things you can do. One is you could suggest that as you give money out in technology-based demonstration grants, that there be a clear vision of the goals that that community is looking to reach for their students. That the project demonstrate some mechanism of systemic reform; that this is not money to do what we are doing today a little bit better, but it is going to be used to dramatically change the way teachers teach and students learn.

And I also think that realistically what we have seen is that the private sector has been very willing to partner with educational institutions. Because we bring some expertise to the table in networking and computer resources, and if we can work with the practitioner who brings tremendous experience in content, that is a very appropriate marriage.

And I think that the projects you will hear about later are all ones where there is a very rich partnership of educators, private sector, and the local community involved in some way. And increasingly, I think that we have seen communities are recognizing that this new technology is extremely effective and important, and are either beginning to allocate additional resources to support it or have decided that they can reallocate resources from other projects that no longer have the importance that they used to compared to these new enterprises.

Senator EXON. Thank you very much. Senator Burns.

Senator BURNS. Well real quickly, we have got to get to our—to the nuts and bolts, I think, of this hearing real quickly and we will move it along. And I would ask that—I have some questions that I want to submit to you in writing and for your response.

Just a couple of questions. Ms. Roberts, thank you for coming this morning. Your 1989 report on distance education found that: "Regulatory uncertainties in telecommunications field make planning for distance education difficult."

Could you just expound on that just a little bit, because I think it is going to be very important as we make policies later on.

Dr. ROBERTS. I think you are well aware of all of the debates around who can be players in the information world. And when we talked about the regulatory uncertainties, we were talking about what role, for example, would the telephone industry play? What would happen in the cable industry?

There was talk at that point of reregulation of cable, and, of course, there has been a further move toward that since the report. But equally there was a sense that—and particularly on the part of local programs—that they just could not really do the kind of long-range planning that they would like to do because there was no clear long-term policy in this country about how we were going to support educational uses of telecommunications and telecommunications resources.

And so when you start to look at examples, what you find is that the States, who often set a lot of the rate structures, local communities who negotiate with cable providers, and the Federal Government in its telecommunications policies or lack thereof, all are part of the playing field that the education community is not really part of.

The educators would like to be at the table, would like to be key in helping to make the kinds of decisions that benefit this country as a whole, but their needs are often not considered as telecommunications policy decisions are being made.

So, it is a combination of rates, and who can provide services. It is also an issue of what the long-term picture of technology development will be. For example, it becomes very important to be assured that we will eventually have a broadband network that reaches every home, every school, every hospital, every institution in the community. But it is very difficult to make decisions on something that you are not certain about—when it would happen and what kind of access you would have to it.

Senator BURNS. In other words, putting it in layman's terms that I can understand, you are saying that we have some policy barriers that will not let this flow.

Dr. ROBERTS. Absolutely.

Senator BURNS. We are considering now the reregulation of cable. Would it be, in your opinion, that reregulation would sort of inhibit the growth or their growth or their playing their part in the education system should this happen?

Dr. ROBERTS. Well, I have not looked at that question that way, and so I really do not want to comment specifically on that. My sense is that the kind of support that cable could provide to education is enormous. And in some communities and, even in some cases, national cable network providers have taken a very strong proactive role in supporting education. You mentioned Cable in the Classroom as an example.

But this kind of proactivity does not assure equal access and equal participation in every community. So, of course, there have been some proposals to require that local companies provide or continue to provide access, public access for educational and public service uses. And I think that it is in the interest of the cable companies that they provide this access and I would argue that the industry as a whole ought to see that the education community is an important ally in their future. But that is not necessarily always the case.

Senator BURNS. Mr. Miller, I would appreciate your comments on two policy recommendations from your organization. One of them is: The Federal Government should facilitate the development of a broadband educational network utilizing the public network with an open-system architecture—No. 1 in those recommendations.

And No. 2: The Federal Government should remove the regulatory and business restrictions on telecommunications carriers for distance-learning and educational applications.

Mr. MILLER. The first one, I think, is in fact well underway with the development of the National Research and Educational Network in terms of a facility that provides the national backbone, as it were, for providing access to schools.

I think there are still some open issues regarding that in terms of assuring that the system be developed with the open standards that will make connectivity available using whatever piece of hardware or communications materials that you have, so you do not strand the investment, as you suggested, that is already made in our schools. And second, that we assure equal governance so that the use of such a backbone is not dominated by one particular constituency who may have very important needs, but not at the expense of others.

So, I think that that is underway, although as an organization we still have some concerns about the openness and also the governance responsibilities.

And I guess the one you were describing on removing the lines of business restriction, we would, I think, want to. We have, you have noticed all the way through, said provide incentives. And we have felt that increasingly regulation both in the educational community, as well in the telecommunications industry, acts as disincentives for innovative behavior and are increasingly difficult to maintain in an environment where technology is changing at an astronomical rate.

And so what I think that recommendation is saying is let everybody compete in this market. Let all people, cable providers, telephone companies, provide all levels of service and therefore open up a richer partnership for institutions and schools. They could work with their cable company, they could work with a satellite broadcasting vendor, they might work with a telephone company. And try and develop the richest possible partnership that is available, and the best way to do that is to insure an open access and level playing field for all of the participants in the marketplace.

Senator BURNS. I was happy to hear you comment that, yes, not only are we trying to develop the tools to better educate our kids, but the tool will also be used as furthering education for our teachers on how to use the technologies. So, I am happy your brought that up.

I have other questions, but in the essence of time, Mr. Chairman, thank you very much. And I want to thank both of you for coming. It has been very enlightening. Thank you.

Senator EXON. Thank you, Senator Burns. Senator Bingaman.

Senator BINGAMAN. Mr. Chairman, I appreciate the testimony and I know of the excellent work that both witnesses have done in this area. In the interests of the committee's time, I will not ask questions at this point. I know you have three additional panels, but I appreciate the chance to be here. Thank you.

Senator EXON. Thank you, Senator Bingaman.

I, in closing, would like to insert in the record some explanation of the statements that I made earlier with regard to the funding of education in our question and answer session with the assistant secretary. I would simply point out that in the President's budget the President did indeed increase funding for some educational programs and some small increase overall. The President increased, for example, the Pell grant program. Educational research, which was referenced by the Assistant Secretary, did get a plus up. Head Start got an increase.

But I would also point out at the same time to a large extent we were robbing Peter to pay Paul here, because while I salute the President for the leadership in those areas, I would simply point out that there were major cuts in the President's budget for impacted aid, for compensatory education, for student financial assistance, for library programs, for interim assistance to State legislation for community service block grants, economic dislocation of worker adjustment assistance, jobs of course, community service for employment for older Americans, and so forth.

And I would like to, without objection, include that in the record at this point. Without objection, that is so ordered.

Thank you very much, Ms. Roberts and Mr. Miller. We appreciated very much your excellent testimony and you are excused.

Dr. ROBERTS. Thank you, Mr. Chairman.

Mr. MILLER. Thank you.

Senator EXON. I will now call the second panel. Mr. Jack Clifford, the chairman of the board of Colony Communications, Inc.; Mr. David Morgan, director—network design; Mr. Ron Schoenherr, senior vice president, Educational Television Commission of Columbia, SC.

Gentlemen, if you would please come forward at this time and take your places, we will move onto this panel. As I have indicated earlier, your written statements, if any, have already been submitted into the record. I would ask that you summarize at this time and we will begin with Mr. Clifford.

STATEMENT OF JACK CLIFFORD, CHAIRMAN OF THE BOARD, COLONY COMMUNICATIONS, INC.

Mr. CLIFFORD. Good morning. Mr. Chairman, Senator Burns, my name is Jack C. Clifford. I am chairman of Colony Communications, Inc., a national cable company headquartered in Providence, RI. We serve 790,000 cable subscribers in 9 States.

I also serve on the board of directors of Cable in the Classroom, the National Cable Television Association, and on C–SPAN's board. Today I am testifying on behalf of the NCTA.

Cable television is a key component of our Nation's flexible, hybrid telecommunications infrastructure. It is deeply involved in our Nation's efforts to provide quality educational programming, distance learning, and innovative instructional technologies.

Indeed, cable contributes to education in three ways. One, through the efforts of program networks like, well, the Discovery Channel, Mind Extension University. Second, through the efforts of cable operators like my company, Colony Communications. And third through industrywide initiatives like Cable in the Classroom.

The cable industry's central initiative in education is Cable in the Classroom. This is a nonprofit service created in 1989 by 43 multiple-system operators, MSO's, and 20 programmers, to help bring the power of television to America's schools.

Cable in the Classroom offers blocks of education programming without commercial interruption for use by teachers as additional learning tools in the classroom. Member operators provide free installation and free basic service to all junior and senior high schools passed by their systems. Many also wire elementary schools in their service areas.

As of early this year, 1992, Cable in the Classroom was serving over 43,000 elementary, junior, and senior high schools and providing more than 500 hours a month of commercial-free programming to 24 million elementary and secondary students. The number of students served is expected, by the way, to double within the next year as more schools are reached and wired.

On the programming side, 19 cable networks and PBS provide commercial-free educational material. It is now possible to earn graduate degrees nationwide through cable television's Mind Extension University. The Learning Channel offers Teacher TV, a series created by, for, and about educators to help them develop teaching strategies and specific class plans.

On the Discovery Channel, teachers can find Assignment Discovery, an award-winning documentary series which they can view and discuss with their students. The CNN Newsroom provides teachers with a 15-minute commercial-free daily news program designed for school use. The program highlights the day's top stories and features a detailed report on a story of topical interest, as well as a special report that investigates political, social, economic, and national issues.

On the operational side, cable systems are using state-of-the-art fiber optic to deliver educational programming, including two-way interactive learning opportunities. Some examples are in Dodge City, KS, TCI donated a new interactive fiber optic link between the city schools and the Southwest High Plains educational cooperative, after learning that Southwestern Bell had rejected the school system's request for a low-cost cable link.

In Chicago, IL and Newton, MA, Continental Cablevision is providing local schools with state-of-the-art multimedia hookups which allow teachers and students to hold face-to-face conversations for classrooms several miles apart. In Prince Georges County, MD, Metrovision has linked several high schools and a community college into electronic classrooms that feature interactive audio,video, and computer services.

As cable companies continue to upgrade their facilities, our capacity to provide interactive, multimedia educational services will grow as well. The cable industry currently plans to spend $24 billion over the next 10 years to upgrade its plant and equipment, and over 60 percent of existing systems will be rebuilt. Optical fiber will be an integral part of this upgrading, and by 1999 will account for almost 40 percent of the total annual investment in trunk and feeder cable.

Through continued development and application of fiber optics and other innovative technologies, the cable industry will be a major provider of interactive, broadband communications services throughout the United States.

While the cable industry will become an increasingly important participant in this Nation's efforts to expand educational opportunities, it does not claim to be the only player. Each technology has its very important role.

As the Office of Technology Assessment noted in its recent study called "Linking for Learning," our Nation's telecommunications infrastructure is a flexible hybrid. It is composed of satellite, radio, telephone, broadcast, microwave, and cable television components which allow users different choices in moving voice, data, and video on to a chosen destination.

The OTA also noted that, and I quote here:

> There is no single best model of distance learning. Our common goal, therefore, should not be promote technology for technology's sake, but to encourage each telecommunications provider to do its part in strengthening and expanding educational

opportunities. Now this is especially true since education in the United States is a joint effort involving Federal, State, and local governments, communities, and the private sector.

The challenge for each of the players on our National effort is to bridge the gap between what is already available and those who want to take advantage of it and use it. Rather than pick individual winners and losers, the Federal Government should focus on providing the funds, equipment, teacher training, and interstate coordination required to bring this to all Americans.

As cable deploys state-of-the-art fiber and satellite technologies and extends the reach of its programming networks, the cable industry will be a key contributor to our Nation's goal of making instructional programming and continuing education universally available.

I thank you very much for the invitation to be here today and I am ready to answer your questions.

[The prepared statement of Mr. Clifford follows:]

PREPARED STATEMENT OF JACK C. CLIFFORD

Mr. Chairman and members of the Committee, my name is Jack C. Clifford. I am Chairman of Colony Communications, Inc., a national cable company headquartered in Providence, Rhode Island, which serves 790,000 cable subscribers in 9 states. Colony is a wholly-owned subsidiary of the Providence Journal Company, a multimedia corporation which also owns 9 broadcast television stations and which publishes The Providence Journal, The Evening Bulletin, and The Providence Sunday Journal. I serve on the Board of Directors of both Cable in the Classroom and the National Cable Television Association (NCTA); I am testifying today on NCTA's behalf.

NCTA represents several thousand cable systems which serve more than 90 percent of the 56 million cable households in the United States; it also represents 63 cable networks engaged in creating and distributing a broad range of programming for cable television. We appreciate this opportunity to submit testimony on the role that the cable industry is playing in advancing educational programming and technology in the United States.

I. CABLE TELEVISION'S ROLE IN EDUCATION AND TECHNOLOGY: AN OVERVIEW

The cable industry is deeply involved in our nation's efforts to provide quality educational programming and innovative instructional technologies. Although most Americans view cable primarily as an entertainment medium and credit it with improving the scope and quality of television, the cable industry plays a much wider role. Cable is currently going beyond entertainment to provide a broad range of educational services using state-of-the-art technologies. This enables cable companies to offer not only traditional instructional programming but also distance learning and two-way interactive education, both in the classroom and at home.

Once just a wire used to retransmit broadcast signals to remote locations, cable now offers more than 70 national programming networks, 20 of which include educational material. Moreover, cable operators are rapidly upgrading their systems with optical fiber, interactive capability, addressability, and connectivity with other media such as cellular telephones and long distance carriers. Cable already passes 96 percent of American households, and these upgrades will increase cable's ability to provide an infrastructure over which a wide variety of educational material and information services can be made available throughout the country. As Jim Chiddix, one of our industry's leading experts on technology, recently stated at the Penn State Cable Museum:

> Beginning with our installed base of broadband coaxial cable in the local loop, and aided by technologies from the fields of optical fiber, microcomputers, data transmission, mass data storage, and digital switching, we have the tools at our disposal to construct a system which delivers almost any imaginable entertainment, education, information, or communications service. We have only begun to realize what the * * * system that we have put into place over the last four decades can really do.

Some industries would like to claim the title of being our nation's primary telecommunications provider. Indeed, the telephone companies are making great promises (especially in the areas of health care and education) in an effort to be anointed, by legislative fiat, as the nation's primary—if not sole—telecommunications infrastructure.

However, as the Office of Technology Assessment has noted, ournation's telecommunications infrastructure is a flexible hybrid.[1] It is composed of satellite, radio, telephone, broadcast, microwave, and cable components which allow users different choices in moving voice, data, and video to a chosen destination. In analyzing the benefits provided by the decentralized, pluralistic telecommunications infrastructure that has evolved in the United States, the Consumer Federation of America and the American Association of Retired Persons have commented:

> Telephone and cable television service are approaching universal availability. With 40 million personal computers (PCs) deployed in the business and residential sectors, and rapid spread of PCs likely to push this number to the range of 60 to 80 million in the near future, there is no technological barrier to an information age mass market * * *
>
> PC-based services are also widely available, with thousands of information age vendors offering a broad array of services * * * The number of subscribers has been growing at almost 20 percent per year. Yet, only about one twentieth of the potential market has been penetrated.
>
> * * * [T]he decentralized model for the deployment of information age services is preferable for both economic and social reasons * * * It is achieving rapid deployment of services under conditions in which individual choices are paramount. Because there are likely to be few barriers to the information age for the vast majority and many of the services that will be offered are luxuries, the pragmatic evaluation of the value of services on an individual basis will maximize consumer sovereignty and welfare.[2]

Just as the United States has a hybrid telecommunications infrastructure, so "there is no single best model of distance learning" (OTA: p. 26). Indeed, Donald Ledwig of the Corporation for Public Broadcasting advised the Senate Labor Committee in written testimony on October 31, 1991, that "CPB does not believe that any one technology can be designated as the best technology for education" (p. 5).

Our common goal, therefore, should not be to promote technology for technology's sake, but to encourage each telecommunications provider to do its part in strengthening and expanding educational opportunity. This is especially true since education in the United States is a joint effort, involving federal, state, and local governments, communities, and the private sector.

The challenge for all of us now is to bridge the gap between what is already available and those who want to use it. As John Hendricks, Chairman and CEO of Discovery Communications, suggested to this Committee on February 28, 1992, during a hearing on Senator Bingaman's instructional channel amendment, the issue is not so much finding educational programming as it is packaging and distributing it effectively. Toward this end, the cable television industry is developing instructional programming; wiring schools; contributing audio-visual equipment, teaching guides, and satellite dishes at cost; providing copyright clearances; and offering programmatic and technical support for schools, teachers, and students. As the cable industry steadily upgrades the capacity of its infrastructure, it will be increasingly well-positioned to build on these contributions to American education.

II. THE CABLE INDUSTRY'S GROWING ROLE IN EDUCATION

The cable industry is rapidly expanding its involvement with education and distance learning. On a national scale, operators and programmers have come together to form Cable in the Classroom, a non-profit service to help promote education in the United States and facilitate the distribution of instructional material to our nation's schools. On the programming side, 20 cable networks provide educational material. On the operations side, cable systems are using state-of-the-art technologies such as fiber optics to promote distance learning and access to education. Cable's commitment to education will continue to increase as new programming, channel capacity, and distribution technologies come on line in the years ahead.

A. Cable in the Classroom

Twenty cable program networks and forty-three multiple system operators (MSOs) have joined to create Cable in the Classroom, a non-profit enterprise devoted to matching the resources of the cable television industry with the needs of America's schools. Cable in the Classroom members offer blocks of educational programming—without commercial interruption—for use by teachers as additional learning tools in the classroom. Subjects include curriculum-based programs in math, English, science, social studies, biology, foreign languages, and health/vocational/technical studies, as well as material drawn from the performing arts.

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[1] OTA–SET–430, Linking For Learning: A New Course for Education, November 1989: p. 8.

[2] Mark Cooper, Expanding the information Age for the 1990s: A Pragmatic Consumer Analysis, January 11, 1990: pp. ES–1, ES–4.

On the national level, Cable in the Classroom serves three purposes: to build awareness of the cable industry's educational initiative; to develop materials to support cable companies as they work with educators; and to serve as a clearinghouse for statistical and anecdotal information on cable's use in schools. In 1991, cable operators and programmers invested $74 million to support education through Cable in the Classroom; this figure represents the cumulative value of the programming, installation, services, resources, and staffing devoted to Cable in the Classroom projects.

Programmer members of Cable in the Classroom are committed to several goals. They offer a variety of high-quality cable programs without commercial interruption; supply curriculum-based support materials at low or no cost to assist teachers in using the programs in the classroom; and provide extended copyright clearances that allow teachers to replay Cable in the Classroom programs on videotape.

Member operators provide free installation and free basic service to all junior and senior high schools passed by their systems. Some cable companies also offer satellite dishes at cost to public schools outside their delivery areas; others offer cable installation to elementary schools, not just junior and senior high schools. Local companies work with their schools to build awareness of the diversity of programs available on cable. Together, they attempt to address equipment needs and encourage optimal use of programs.

Cable in the Classroom is an effective teaching device on both the local and national levels:

- As of early 1992, Cable in the Classroom was serving over 43,000 elementary, junior high, and senior high schools and providing more than 500 hours a month of commercial-free programming to 24 million elementary and secondary students.
- The number of students served is expected to double within a year, and the industry's goal is to provide educational programming to every public high school passed by cable by December 1992 and every state-accredited private secondary school by September 1994. (As of May 1992, Cable in the Classroom reached 89 percent of the public secondary schools passed by cable in its members' service areas.)
- Even though providing free cable connections to elementary schools is not yet an official goal of the organization, the industry has hooked up 26,790 private and public elementary schools (68 percent of the total in members' areas).
- Seventy-eight percent of teachers with access to Cable in the Classroom use at least one of its program services, including PBS; the average number of networks used by teachers is 2½. Sixty-nine percent of teachers use at least one cable network in their classes (excluding PBS),and satisfaction with program quality is high overall.[3]

Schools served by Cable in the Classroom receive several issues of a monthly magazine which offers detailed educational program listings by subject areas, as well as feature articles and insights on how teachers across the country use different programs in the classroom. Copyright information is also included in the Cable in the Classroom magazine. An onscreen announcement of the specific copyright clearance for each program further aids teachers in utilizing the programs. Fran the premiere issue in February 1991, circulation has increased from 29,000 to more than 80,000--a 175 percent increase in just 17 months.

B. Cable Networks and Education: Some Leading Examples

One of the reasons Cable in the Classroom is possible is that 20 out of the 76 national cable television networks offer educational programming. For several cable networks, education and information are their primary missions. These networks include The Discovery Channel, The Learning Channel, C-SPAN, and Mind Extension University. Other cable networks that have instructional components to their programming include CNN, Nickelodeon, CNBC, The Family Channel, Arts & Entertainment Network, Black Entertainment Television, Lifetime, The Weather Channel, VISN, ESPN, USA Network, and Bravo. These networks reach nearly 60 million homes across the United States (through cable, MDDS, and TVRO systems) and, as the following three examples demonstrate, contribute significantly to education.

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[3] Research Communications Ltd., Cable in the Classroom: An Assessment of Use and Satisfaction with Services among Secondary School Teachers, Executive Summary, May 1992: pp. 1–2.

1. Discovery communications: The Discovery Channel and The Learning Channel

The Discovery Channel, the nation's fifth largest cable network with 8 million households, and The Learning Channel, which reaches 16.9 million households, make up Discovery Networks, a unit of Discovery Communications, Inc. Both networks are founding members of Cable in the Classroom.

Discovery Communications is devoted to creating dynamic television for both lifelong learners at home and educators in their classrooms. Its two networks have complementary missions. The Discovery Channel aims to enlighten viewers by showing them documentaries about the world in which we live. The Learning Channel is dedicated to feeding the imagination—to showing its viewers the world of ideas.

For teachers, The Discovery Channel creates a daily program that gives educators hundreds of commercial-free documentaries each year that they can tape and use freely in their classrooms. Called "Assignment Discovery," this award-winning series was founded in 1989 to provide teachers with 25-minute docunentaries that they can show—in whole or in part—with their established class plans and discuss during the average class period. Each documentary is accompanied on-air by discussion questions and suggested readings selected by the American Association of School Librarians. The goal of this program is not to fill class time with television viewing, but to work with educators to help them enhance their curricula. "Assignment Discovery" has won over 16 awards from educational and television organizations in the United States and abroad.

Discovery Communications believes that television can be used as a forum to help educators utilize the medium and to help young people learn how to watch television more effectively. This spring and summer, a teaching-with-television training video is part of "Assignment Discovery's" line-up; it offers suggestions on effectively using television as an active learning tool and tips on teaching young people to be media literate, i.e., to understand the images that television brings into their homes.

Television can also help parents become more involved in their children1s education and TV viewing habits. Throughout this summer, "Assignment Discovery" is airing two series of public service announcements that were produced in association with the National PTA. One series is made up of 10 animated spots that encourage parents to help their children develop such fundamental skills as reading, writing, history, science, and interpersonal communications. A second series of PSAs features the President of the National PTA, Pat Henry, as well as many of the state PTA presidents, encouraging parents to monitor programs and to watch television with their children.

Teachers were so enthusiastic about using "Assignment Discovery" programming in their classrooms that The Discovery Channel, the world's largest purchaser of documentary product, took the next step in creating television that is useful in the classroom. The network mixed video technology with easy-to-use computer technology and launched its multimedia division—The Discovery Interactive Library. In July 1991, the company began selling the first three titles in its now growing interactive videodisc library: "Insects: Little Giants of the World"; "Investigating History: Treasures from the Deep"; and "Investigating Science: Treasures from the Deep." This spring, the library worked closely with the Prentice Hall School Division to design interactive videodiscs and textbooks to meet the requirements of educators nationwide. As part of the initial venture, five Discovery interactive video titles will form the core multimedia component of the "Prentice Hall Science" program, which is currently under consideration by the State of California for official adoption into the state's curriculum. This package allows teachers to focus on specific science topics while encouraging students to solve problems and probe subjects in new ways.

For prime-time viewing, The Discovery Channel presents documentaries and produces high-quality series and specials that provide viewers of all ages information about the state of the natural world, with such programs as the Peabody Award-winning "Chimps of Goobe" and the critically acclaimed "In the Company of Whales." Discovery also sheds light on historical and cultural issues with programs such as the upcoming series "Frontiers of Flight," which is produced in association with the Smithsonian; Carlos Fuentes' "Buried Mirror: Reflections on Spain and the New World"; "Roger Kennedy's Rediscovering America"; and "The Next Step," a series that focuses on future developments in science and technology.

On Sunday, March 8, 1992, The Discovery Channel telecast "The Presidential Candidates: Address to the Nation"—a commercial-free public affairs programing event that built upon Discovery's commitment to providing new dimensions to television journalism. The different Democratic and Republican contenders for the White House were given 20 minutes to address the nation directly about their vision for America's future.

The Learning Channel, which Discovery purchased last summer and has extensively reprogrammed, is reaching out to the educational community with a breakthrough series for teachers which helps educators enhance their profession and the state of education in America today. Airing every Sunday night at 6:00PM (ET), "Teacher TV" is a half-hour series that is created for, by, and about teachers; over 2,000 individual teachers were surveyed for their input into the programming. A coproduction with the National Education Association, "Teacher TV" is designed as a communications tool that offers specific teaching strategies and practical resources to assist instructors in their efforts.

Parents can also use The Learning Channel to help their middle school children learn more about mathematics this summer, with the network's new series "Mad Math." An up-beat 13-part series, "Mad Math" explores the world of fractions, decimals, and ratios and relates them to everyday situations. This is the first of what will be many educational programs on The Learning Channel geared to young and very young people. The network is currently working with educators and educational television producers to create the highest-quality learning experience that will be engaging, enjoyable, and inspirational to young learners.

On May 20, 1992, The Learning Channel announced that it is spearheading a partnership between the cable and newspaper industries to encourage literacy throughout the United States. The Learning Channel is also joining with the Newspaper Association of America in the project called "To Read." On September 8, International Literacy Day, The Learning Channel will telecast a special hour-long celebration of reading. That same week, newspapers across the country will publish special "To Read" supplements customized for their communities, and local cable companies will work to promote literacy in their towns and cities. In addition, The Learning Channel telecasts two series designed specifically for individuals at low-literacy levels: "No Problem," a series for Spanish-speaking viewers who are learning English as a second language, and "Learn To Read," a series for low-literacy adults who want to learn to read better in the privacy of their own homes.

Discovery Communications also collaborates with educators and businesses in putting cable television to work for the educational community. "Assignment Discovery's" advisory board includes the National Education Association, the National School Boards Association, the National Association of Secondary School Principals, the American Association of School Administrators, and the National PTA. To create educational programming, Discovery has worked with such institutions as the Getty Foundation for the Advancement of the Arts and the National Education Association. Discovery Communications recently signed an agreement with the Center for Democracy in Washington and the Commonwealth of Independent States for Discovery Communications to produce educational programming about America's democratic system that will be aired on Russian television, as well as The Learning Channel.

2. *Mind Extension University (ME/U)*

Jones International founded Mind Extension University: The Education Network in 1987. The goal of ME/U is to "make all America a school"—to combine the technologies of cable and satellite television with the resources of the nation's top distance learning providers to create a nationwide "electronic classroom without walls." ME/U is one of the most dynamic cable networks in America, currently serving almost 19 million cable and satellite-dish households.

The network has been called a "lifelong learning resource" because it presents several major program elements. For example, ME/U offers 50 for- credit undergraduate and graduate courses from 20 major colleges and universities around the country. It also delivers complete degree programs such as a Master of Business Administration from Colorado State University, a Bachelor's Degree in Management from the University of Maryland, and a Masters of Arts and Education Technology from George Washington University.

ME/U has teamed with the TI-IN Network to provide "distance learning" instructional material for high school students and staff development for their teachers. The TI-IN Network was an original recipient of a federal Star Schools grant in 1988. The seed money provided by Congress enabled The TI-IN United Star Network to provide satellite-delivered interactive instructional services to 316 sites, serving more than 100,000 teachers and providing more than 20,000 students with credit and non-credit courses. The Office of Technology Assessment has documented the effectiveness of distance learning and TI-IN's approach in its 1989 report to Congress, "Linking for Learning—A New Course for Education." In fact, the success of the TI-IN research and demonstration Star Schools project led OTA to introduce TI-IN to the Mind Extension University network.

Cable subscribers who get ME/U receive TI-IN's secondary school instructional material, including courses in foreign languages, science, mathematics, psychology, and sociology. Together they provide live, interactive instructional material for high school, advanced placement, college, and graduate students as well as professionals interested in continuing their education. ME/U and TI-IN also offer a literacy program, GED preparation, English-as-a-Second-Language, student enrichment, and staff development for teachers. This satellite-cable partnership provides a low-cost, efficient way to disseminate quality education, not only to schools but also to living rooms across America.

With the Library of Congress, ME/U presents each week the Global Library Project. This project, funded by a $1 million grant from Jones Intercable, seeks to bring to the nation information from the largest repository of knowledge in the world. ME/U also draws material from colleges and universities around the country, including Penn State, Kansas State, the University of South Carolina, and Colorado State University.

On May 15, 1992—for the first time ever through television—four students received MBAs from Colorado State University without ever having set foot on campus until the date of their graduation. They studied for their degrees at home in four separate states—Alaska, Oklahoma, Connecticut, and California—through Mind Extension University. As Senator Burns remarked to his colleagues on the Senate floor June 2, 1992:

> Mind Extension University demonstrates how advanced technology can be utilized to expand access to quality education. Through its academic degree programs, such as the MBA available at Colorado State University, the Masters of Arts in Education Technology at George Washington University and others, ME/U is helping Americans develop the skills necessary to meet the challenges of the 21st century (Congressional Record: S 7273).

C. Cable Technology and Education: What Cable's Infrastructure Can Deliver

Twenty years ago, cable's technology was limited to copper and microwave, and there were no program networks distributed by satellite. The nation was served by 2,800 cable systems which passed less than a third of American homes. Six and one-half million Americans (10 percent) subscribed to cable, and they received an average of only 6 channels. Today, cable programming is distributed nationwide to cable systems and home satellite dish owners by satellite. The satellite networks are retransmitted by 10,700 cable systems on fiber optic and copper wires which pass 96 percent of American homes; over 61 percent subscribe. The average cable home now receives approximately 40 channels, with 29 percent enjoying more than 54 channels.

Today, this infrastructure—using the cable programming described in the previous section—makes available a number of educational services. As cable continues to upgrade its plant, it will increase the opportunities for cable to deliver educational programming. In particular, cable's growing deployment of fiber optic technology will support two-way, interactive applications and will increase the number of channels that each system can provide.

1. Cable's use of fiber: an overview

The cable industry is accelerating the deployment of fiber optic technology to enhance system capabilities and increase channel capacity. Optical fiber technology uses very thin strands of glass to carry light signals generated by lasers or other light sources. Information can be carried by light in much the same way as information is carried by electronic signals over the copper "twisted pair" wires used by telephone systems for voice and data and over the coaxial cables used by cable systems for video and data. Fiber has wider bandwidth and carrying capacity than traditional copper twisted pairs, although fiber, in its current applications, does not have more usable bandwidth than coaxial cable.

2. The benefits of fiber

The main advantage of fiber over cable is that signals can be carried greater distances with lower loss of power and less need for amplification. The amplifiers needed to strengthen cable signals degrade the signals, and long stretches or "cascades" of amplifiers can cause poor signal quality and a loss in the number of channels that can be delivered. Since fiber helps maintain signal strength, it allows systems to reduce the number of amplifiers between the headend and the customer, thus resulting in lower plant costs despite the slightly higher cost of installing fiber and its associated electronics.

Improvements that result from the cable industry's installation of optical fiber include:

(a) Cost effective upgrades of channel capacity: The existing coaxial cable to every home is theoretically capable of carrying 166 6mHz channels. Reducing the number of amplifiers in a cascade between the headend and customer through the use of fiber allows significant channel upgrades without expensive replacement of the local loop, i.e., the drop cables to each individual home.

(b) Improved reliability: Because there are fewer amplifiers in a typical cascade to fail in a fiber-enhanced system, there are fewer customers affected by any given individual amplifier failure. Jones Intercable's fiber-based cable system design in Augusta, Georgia, for example, will cut cable service outages from one or two per year to one every five years.

(c) Reduced operating costs: Systems with many amplifiers spend more on maintenance because amplifiers must be "balanced," or electronically fine-tuned, in order to give the best performance. Because fiber reduces the number of amplifiers needed in a cascade, it takes less time to balance a line or find a faulty amplifier. These efficiencies can reduce a cable system's operating costs. For example, Cablevision Systems in Hammondsport, New York, estimates that it saves 500 employee-hours annually in maintenance costs from installing just ten miles of fiber.

(d) Improved signal quality: Because of the reduced number of amplifiers between the headend and customer, transmissions along fiber optic cable degrade far less quickly and result in a stronger, clearer picture at the receiving end. Fiber also may be used to replace microwave transmission links which are subject to radio interference. For example, Maclean Hunter Cable TV expects an immediate increase in picture quality from its fiber-based cable system in northern New Jersey.

3. Growth in cable's use of fiber

In 1982, the cable system located in Alameda, California, was the first to attempt the system-wide use of fiber in delivering cable television and other enhanced services. Since this initial deployment, improvements in the technology and methods of deployment have resulted in a trend toward fiber installation throughout the cable industry. In fact, every one of the twenty largest multiple system operators (MSOs) has installed fiber in their systems. The amount of fiber installed by these companies has increased by 400 percent since 1988, with over 13 million cable subscribers now served by systems utilizing fiber optics. Current estimates indicate that cable industry deployment of fiber is expected to grow at an annual rate of 25 percent over the next decade. Indeed, cable companies have already installed as much fiber, as a percentage of their total subscriber plant, as the telephone companies.[4] Because cable only needs to fiber a small percentage of its plant (trunk and feeder lines) in order to create a flexible, high capacity network, it will be able to offer a wide range of educational services long before the telephone companies, which have only limited-capacity twisted pairs to the home.

4. Point-to-point communications

Fiber technology is being employed by the cable industry to improve comications that require high capacity connections between two locations. One example of these "point-to-point communications" is known as "super- trunking"—where fiber is used to link separate headends together. Other point-to-point fiber applications used by the industry include linking remote production studios—for example, facilities which record local council meetings for the government access channel—with a cable headend, or connecting the headend with a satellite dish or antenna which must be located at a remote site.

In addition to using fiber for its own facilities, the cable industry provides custom-designed, dedicated fiber links to schools, hospitals, and other organizations. This is being done both on a paid basis—such as when Oceanic Cablevision won the contract to link major buildings on the University of Hawaii's Manoa campus with its computer center—and on a pro bono basis. A press release from Dodge City's Unified School District described cable's role in providing schools in southwest Kansas with freeinteractive cable service as follows:[5]

> DODGE CITY, Kansas—The final three-mile fiber optic cable link between the Dodge City Schools and the Southwest High Plains Educational Cooperative (SWHP) network was officially activated recently by Lee Droegemuller, Kansas Commissioner of Education. *TCI of Kansas, Inc. donated the $68,000 state-of-the-art fiber optic link as a public service after learning that the school system's request for a low-cost cable link from Southwestern Bell had been rejected* (emphasis added).

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[4] Paul Kagan Associates, Cable Television Technology, April 21, 1992: p. 7.

[5] Dodge City Unified School District 443, TCI Brings Interactive Cable to Southwest Kansas Schools, December 18, 1991.

This fiber optic link gives rural schools in the SWHP network a two-way audio/visual link with the Dodge City school system. Without this vital link, a number of small rural schools could lose their accreditation due to lack of funding and/or availability of teachers to teach certain key curriculum [sic].

Two-way, or interactive, cable classroom communication is the newest classroom technology available. With interactive cable, an instructor can teach students in two or more locations at one time. The teacher can see and hear all students—including those in remote classrooms—and all the students, no matter where they are, can see and talk with the instructor. Any classroom in the network may be selected by the instructor as a sending site.

Besides giving students in more remote areas access to courses and teachers normally available only in larger cities, the new interactive cable system will be used for continuing education and to help train teachers within the system. The computers and televisions to utilize this new cable link are already in place within the SWHP network.

Interactive cable will also aid in special education classes. Traditionally, the few available special education teachers are assigned to several schools—which means much of their valuable time is spent on the road travelling between schools. With interactive cable, special education students will have more direct contact time with trained teachers, and the amount of non-productive time these teachers must spend commuting between destination points will decrease.

Getting interactive cable is tremendously exciting from an educational point of view," said Dr. Richard Branstrator, Superintendent of Dodge City-based Unified School District #443. "This opens up a whole new world for our students. Its use is limited only by the imagination. With interactive cable I can see the Library of Congress becoming the library for Dodge City High School * * * I can see our students gaining better global understanding by interacting with students in Canada, England, or France in a problem-solving curriculum. TCI was already active in our education system, providing Cable in the Classroom and X-Press X-Change at no charge, but their generous offer to donate thousands of dollars to install this interactive cable link was a complete surprise."

"We are extremely pleased to be able to give this new technology to our school systems," said Bob Carl, manager of TCI of Kansas-Dodge City. "Because we installed fiber optics, this system can be easily expanded to meet future needs. We're now discussing the possibility of adding the library and Dodge City Community College to the interactive link during 1992. Our partnership with the Dodge City and Southwest High Plains schools is part of the TCI Education Project, a corporate program to provide commercial-free, educational cable programming and cable hook-ups to schools in TCI's nationwide service areas."

5. Evolutionary applications in cable's use of fiber

A more evolutionary application for fiber is currently known by several names, including "fiber backbone" and "Cable Area Network." In such applications, a fiber link is constructed between the system headend and a point somewhere in the distribution network. These evolutionary applications bring fiber closer to the customer, which means that the signal that reaches the customer has not been degraded by as many amplifiers and other electronics. The highly flexible system that results from evolutionary fiber deployment allows cable systems to deliver more channels, to improve system reliability, and to reduce operating costs.

Fiber backbone or Cable Area Network applications are considered evolutionary because placing fiber in this portion of the network not only makes technical and economic sense today, but also sets the stage for further developments in fiber and other cable technologies which will lead to significant expansion of channel capacity and the introduction of innovative program services. If and when fiber to the home—which is prohibitively expensive today—makes economic sense, cable systems will be positioned to install it efficiently.

Time Warner Cable (formerly ATC), which in 1988 developed the fiber backbone, introduced just two years later a new architecture, called "fiber trunk and feeder" (FTF). The FTF design takes fiber all the way into the feeder plant, which is the last stage before the actual connection to the home.[6] Not only does this design provide the benefits of fiber discussed above, but it is also less expensive than existing coaxial or microwave connections. In the rebuild of the Marion, Indiana, cable system where the FTF design was introduced, Time Warner Cable estimated that replacing 83 miles of coaxial cable with 61 miles of fiber would serve the same number of customers at a 20 percent cost savings. Further, this design breaks the system into individual service areas of 150-200 customers, which allows the system to provide specific programming to neighborhoods or other small clusters of customers.

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[6] It is interesting to note that this design brings fiber as close to the home as "fiber to the curb"—the approach being tested by the telephone industry. Despite the telephone companies' rhetoric, they are no closer to reaching the home with fiber than the cable industry. In fact, several of the Regional Bell Operating Companies (RBOC's) have abandoned the goal of fiber to the home in favor of more realistic plans. (See for example Multichannel News, January 29, 1990: p. 30, and Telephony, April 23, 1990: p. 11.)

The FTF design is the latest in a series of logical, cost effective steps which the cable industry is taking to deploy optical fiber. Fiber is viewed not as an end unto itself, but as a complement to already sophisticated cable systems which will improve system performance and will enable operators to deliver a wider variety of programming and services.

6. *Cable systems of the future*

The cable industry's research and development consortium, Cable Labs, envisions future cable systems to be hybrid fiber/coax systems. This design melds the evolutionary fiber trunking applications, as they are being implemented today, with the coaxial cable used to connect individual homes. The cable industry's vision anticipates that additional service capabilities will be developed under this design through interconnection with other ccnications technologies and services, such as Personal Communications Services (wireless voice communications systems that would use light, inexpensive hand sets and communicate with low power antennas—in effect a low power cellular phone service). Cable companies like Time Warner in New York, TCI in Colorado, and Viacom in California are building these designs now and are exploring new, cutting-edge telecommunications services, such as video-on-demand.

Cable will not only increase its reach in the future, but also dramatically improve the capacity and versatility of its infrastructure. Industry plans call for spending $24 billion over the next ten years to upgrade plant and equipment, and over 60 percent of existing systems will be essentially rebuilt. Optical fiber will be an integral part of this upgrading, and by 1999 will account for almost 40 percent of the total annual investment in trunk and feeder cable. Through continued development and application of fiber optics and other innovative technologies, the cable industry will be at the forefront of communications technology, offering the video network of the future—today. The capacity and interactive capabilities provided by this network will allow the cable industry to realize the full potential of educational programming and innovative instructional techniques.

III. INSTITUTIONAL NETWORKS (I–NETS)

Institutional networks are interactive broadband networks provided by cable companies for governmental, educational, or business use. They are separate from the public home subscriber cable television network and carry point-to-point voice, data, and video signals. I–NETS usually serve specific universities, hospitals, or government offices in a franchise area and are sometimes established in response to local franchise requirements. Alternatively, some cable companies construct their own I–NETS in order to sell dedicated, high capacity, low cost communications links in their own communities.

I–NETS can be critical in the provision of educational services and distance learning, as the following examples demonstrate:

A. *Continental Cablevision: Chicago, Illinois*

An example of a successful educational I–NET can be found in the northwest suburbs of Chicago. The cable operator responsible for providing the system—Continental Cablevision in Rolling Meadows, Illinois—describes the network as follows:[7]

> The Institutional Network that serves local high schools is the result of a commitment by Continental Cablevision to provide over $275,000 in capital expenditures. Six high schools are now linked using this network and through television, students and teachers from separate schools can simultaneously see and talk with each other. Continental Cablevision's Institutional Network (Continental's I-Net) is a state-of-the-art, multi-channel TV network built exclusively for the use of local schools and other institutions.
>
> The Continental I-Net is an information pathway that uses microwave transmitters, broad-band television amplifiers, and more than 40 miles of television cable. Continental has spent more than $125,000 in microwave transmitters and receivers and over $150,000 in cable amplifiers and other related hardware.

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[7] Continental Cablevision, Continental Cablevision Institutional Network: January 1991.

TCI expenditures to provide the portion of the network serving Arlington Heights, Mt. Prospect and Wheeling are at least as high.

Using two separate microwave links, the Continental I-Net takes a video channel from each school then sends all six channels through the air to receive sites several miles away. From the microwave receivers, a separate cable system using exclusive wires for I-Net transmission takes the channels all the way into the interactive classrooms. The microwave and cable lines operate in both directions allowing the schools to transmit channels as well as receive. The end result of Continental's I-Net allows students or teachers at one building to hold face-to-face conversations with someone fifteen miles away.

Operating the I-Net costs Continental more than $40,000 annually. Having a second, separate cable system linking the schools involves the use of power purchased from CE, amplifiers, twelve microwave transmitters and receivers. Maintaining the INet is a full-time job for a highly trained field technician.

The I-Net was established in 1983 as part of the awarding of cable television franchises. The cable television companies invested substantial dollars (approximately $500,000) to create a separate institutional network. That investment went largely unused until High School District 214 began its efforts to link up to the I-Net. In 1989 High School District 214 completed expenditures to equip interactive classrooms. Field testing began in 1989 for the pilot program introduced in the 1990-91 school year.

The cost of building and maintaining the I-Net is completely absorbed by Continental and TCI. High School District 214 has access to this multi-channel television network free of charge for the life of the cable television franchise. Purchasing multi-channel transmission facilities from some other source would easily exceed $10,000 per month.

Providing state-of-the-art facilities to the community through The Continental I-Net is just part of Continental's commitment to our communities. Continental is part of The Cable Alliance For Education (CAFE), a nationwide foundation that brings together cable operators (like Continental) with cable program networks (like A&E, Discovery, CNN and others) and equipment suppliers. Cable In The Classroom is the Alliance's broad range of services to offer specialized cable television programming for educational use. Cable In The Classroom is completely commercial free, and designed for educators' discretional use.

Special programs, study guides, printed support materials and copyright clearance for recording and re-use are some of the services offered through Cable In The Classroom.

B. Metrovision: Prince George's County, Maryland

Another example of successful institutional networks can be found in Prince Georgels County, Maryland, where Metrovision Inc. links several public high schools with the county's community college. A trade reporterdescribed what she found as follows:[8]

> An interactive cable network linking six public high schools with two-way audio and two way video has been functioning since September [1989] in Prince George's County, MD, thanks to the Metrovision Inc. system there. About 35 students attend the cable classroom every weekday. It took Metrovision 18 months, 20 miles of fiber and lots of ingenuity to create the network.
>
> The problem: Teachers of advanced programs were scarce and expensive in the community. There simply were not enough students in each school to warrant college credit courses. The solution: linking classrooms with cable and pooling the teachers. Suddenly it became possible to gather enough students from different schools, six to eight each, enabling them to be one step ahead for college.
>
> Each school has equipped a classroom as a television studio, complete with cameras, monitors and modulators. Tables are set in a half-circle, conference-style, and each has a microphone.
>
> When students ask a question, they are heard through the network. Every day, one at a time, the teachers lecture their own class and, via cable, other students several miles away.
>
> The architecture of the network was conceived by the local school district's Scott Schiller, Metrovision project engineer Doug Worley and several county officials beginning in the spring of 1988. Funding was provided by a $1.2 million grant from the Cable Enterprise Fund, which was fed by franchise fees. Even though each school was already wired, a separate drop was put in to link them

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[8] Cable World, December 11, 1989: pp. 16, 25.

to one of Metrovision's two headends. One hundred miles of reverse path on coaxial was also laid.

Because the pictures are run through an audiovisual center eight miles north of the main headend, Metrovision decided to run fiber between the two sites—a first for the plant. (Anixter Cable TV did the subcontracting work.) Another fiber trunk runs between each headend. Without fiber there would have been a 120-amplifier cascade between two sites linked in the network—the Bonnie F. Johns Educational Media Center in Palmer Park, ND, and the school at the southernmost tip of the network, Worley said. Picture quality would have been poor.

Anixter started building in June and finished just before school started. The total cost for Metrovision, including construction and maintenance, was $500,000.

The network uses the two highest channels on the system—39 and 40. One is the "teaching" channel; the other is a four-way split screen showing the students in their different schools. Each classroom has two 15-inch monitors to watch both channels at the same time.

Signals are sent from each school to the headends, using the reverse path. They then go on fiber to the Palmer Park center where they are mixed on a quad screen. Fran there the pictures are sent back through fiber to the first headend, which sends them on coaxial to the three schools it serves. The pictures also are sent through fiber to the second headend, which transmits them on coaxial to the three other schools. In addition, the schools have installed a two-way computer system with an "electronic blackboard"—a pad equipped with a scanner. A telephone network and a facsimile machine are also used extensively.

The curriculum, considering that it is delivered on a high tech network, is rather classical: art history, modern European history, U.S. government, calculus, Spanish 4 and French 3. But the modern technological approach has its champions. The system feels so realistic, said art history teacher Jose Delfin, that "when one student sneezes, the others say 'bless you' without even raising their heads."

Test results show students perform just as well as they would in a more traditional environment.

The electronic classroom also has reinforced Metrovision's "good neighbor" image. The system became operational two years ago and has 51,000 subscribers. No additional personnel have been needed to maintain the network. The county provides a production team that maneuvers cameras in the classrooms.

Having fiber has been so positive that Metrovision engineers "looked around to see where we could use it in other parts of the system," Worley said. Instead of building a third headend, they asked Anixter to run an additional 13 miles to cope with the system's expansion.

Another consequence: Prince George's Community College will soon put its preparation course for the Scholastic Aptitude Test on the interactive network. The system will also be used by the city government for teleconferences and for training programs for educators, Schiller said.

C. Continental Cablevision: Newton, Massachusetts

A third example of how cable I-NETS contribute to education and distance learning comes from Newton, Massachusetts, where the Mayor's office, Newton Public Schools, the High School Library, the Massachusetts Corporation for Educational Telecommunications, and Continental Cablevision issued the following notice on December 23, 1991:

> Distance learning becomes a reality as Mayor Theodore D. Mann announced the installation of state of the art cable and satellite technologies at the Newton Public Schools. Superintendent of Schools Irwin Blumer and representatives of Continental Cablevision and the Massachusetts Corporation for Education Telecommunications (MCET) will join Mayor Mann in a special celebration at Newton North High School on January 7, 1992. The ceremonies, from noon to 2:00 p.m., will include a demonstration of Newton's new "interactive classrooms" and a live "Mass Learnpike" teleconference from MCET.
>
> Mayor Mann and Superintendent Blumer, enthusiastic supporters of expanded cable services for the city and the schools, will be joined by Aldermen and School Committee members as well as teachers, parents and students at both high schools for the opening event.
>
> To demonstrate the capabilities of Newton's new "interactive classrooms" linking Newton's North and South High Schools, North Principal Jim Marini and South Principal Van Seasholes will greet each other via the two-way audio and

video technology. Students in one high school will be able to participate fully in classes taught in the other high school's "interactive classroom" through these state of the art systems. Similar classrooms will be installed in the junior high schools this year. In the future, Newton schools may be able to share classes with universities and colleges.

Newton's communication technology uses the Institutional Cable Network (I–NET) which links all city buildings including the schools. Continental Cablevision installed the "interactive classrooms" in the high school libraries and activated the I–NET over the summer as part of a new license negotiated between mayor Mann and Continental Cablevision. Programs cablecast by Continental Cablevision, received by the satellite dishes at the two high schools, or generated by the schools themselves are cablecast over the I–NET allowing all nineteen Newton schools to participate. Continental Cablevision installed cable outlets throughout the schools and provided each school library with a large-screen monitor and a portable telephone for teleconferencing.

The MCET "Mass Learnpike" teleconference on January 7 will link several schools state-wide including Cohasset, Gill-Montague, Holliston, Wachusett and Winthrop, along with Newton North and Newton South High Schools. The teleconference will originate from the MCET studio and uplink facility in Cambridge and be downlinked by satellites at Newton North and South High Schools. Students will speak to each other over a telephone "audio bridge" connecting all their schools.

The "Mass Learnpike" is a satellite-based broadcast network linking more than 135 Massachusetts school systems to receive academic courses, staff development programs, and special events. Network plans include the addition of 100 new communities during this academic year, as well as 900 hours of original programming for schools.

This month Newton elementary school students, along with students from schools all over the state, were introduced to teleconferencing with BETS "electronic field trip" to Drumlin Farm. Students at Newton South are regular participants in the French language teleconference program "Tour de France." The Newton North Science Club will participate in a March teleconference with the inhabitants of Biosphere.

IV. ACCESS CHANNELS

Under the Cable Act of 1984, "a franchising authority may establish requirements in a franchise with respect to the designation or use of channel capacity for public, educational, or governmental use * * *" [section 611(a)]. In the case of Montgomery County, Maryland, the county council requires Cable TV Montgomery (CTM) to reserve 13 channels for public, educational, and governmental (PEG) use. Eleven of these 13 channels are active and represent 17 percent of Cable TV Montgomery's current channel capacity of 66. There are 5 full-time educational channels on CTM: 2 for use by Montgomery County Public Schools (MCPS), 2 for the University of Maryland, and 1 for Montgomery College; in addition, 8 channels are designated for local community and governmental programming, including the Montgomery County Council, the Rockville City Council, and the City of Takoma Park. Similarly, nearby Fairfax County, Virginia, requires Media General to set aside 14 of its 120 channels for PEG use. Cities may require as many access channels as they choose in their cable franchises in addition to the omnercial leased access channels required by the Cable Act and the local origination channels programmed by cable operators. Cable operators also supplement these channels with their own "local origination" (LO) channels which they program with news, sports, and features of special interest to the local community.

V. COLONY'S COMMITMENT TO EDUCATION

My own company's educational outreach is extensive. Colony Communications was one of the first MSOs to realize how much cable could contribute to education. Colony was a founding member of the Cable Alliance for Education, now known as Cable in the Classroom. We also have a long and successful track record of involvement in the public and private educational institutions in the communities we serve.

As part of our commitment to education, Colony is wiring all public and private schools passed by our systems and is providing them with complimentary basic cable service for use in the classroom. Colony provides approximately $100,000 in cable service to over 400 schools serving approximately 170,000 students.

To make full use of the programming offered, the teachers have to know what is available. In an effort to allow the educators to familiarize themselves with cable's educational programming, Colony supplies schools with over 500 complimentary copies of Cable in the Classroom Magazine, a monthly instructional programming guide. Supplemental information guides and fees for accessing guides have also been paid for by local Colony systems.

Colony's outreach efforts are lead by a fulltime corporate staff member who coordinates Cable in the Classroom activities with local system managers and local school officials. In the past two years, approximately 1,000 teachers have been trained through company and school sponsored "in-service" training programs.

Our early contacts with school officials revealed a need for video equipment and monitors in the schools. In the past year we have purchased more than $40,000 in VCR's and monitors for the schools in our service areas to help teachers use the programming in the classrooms. Colony is currently working on plans for a nationwide competition that will result in the donation of an additional half million dollars of video equipment over the next five years.

Feedback from educators indicates that our efforts have already met with success. For example:

- A current affairs teacher in Westerly, Rhode Island, has seen enrollment in his classes double each semester since he started using commercial-free programming from CNN. More importantly, other teachers have noticed that his students are now reading more, participating more often in class, and doing better academically.
- The teacher of a pregnant-parenting teen program in New Bedford, Massachusetts, tells us, "In teaching NBHS curriculum at an alternative site, it is difficult to access the extra-curriculum which is offered at the high school (labs, speakers, special programs etc.). I rely on cable TV for the enrichment of my students."
- Cooper High School in San Pedro, California, uses cable television extensively. Teachers at the small high school feel that cable TV helps them reach the "high risk" students there who cane from all around the Los Angeles Unified School District.
- A high school social studies teacher says our cable service allows her to help students relate to the subject matter. This Massachusetts teacher uses C-SPAN, Discovery and even music videos to bring the world to her students. Other teachers have made similar comments: "It reinforces listening comprehension skills" * * * "It hooks the kids" * * * "Informative, yet appealing" * * * "[The programs] open a window of information that can be used in different areas."

Colony 's commitment to education does not end with our Cable in the Classroom effort. We help train students about video, news reporting, and production skills through internship programs with the University of Miami, the University of Massachusetts, and several other universities and community colleges located near our cable systems.

In Fall River, Massachusetts, all levels of video production trainees work with our system personnel—including high school students. These students have the opportunity to work with a professional production staff and help produce news and local community programming. In Westerly, Rhode Island, students and teachers are trained by cable system personnel to use video production equipment. The new trainees then televise town council and school committee meetings.

In Irvine, California, and in the suburbs of Minneapolis, Minnesota, students attend regular classes with the use of a cable television institutional network. This I–NET allows students in two or three different schools to attend the same class at the same time. Such "distance learning" allows schools to offer rare courses that they would otherwise be unable to provide.

As dedicated members of the communities we serve, Colony employees are encouraged to become active members of their school systems. News and technical personnel are active on advisory boards and committees; they also take part in special activities such as "Career Day" and "Guest Reader Week".

Our local programming departments have also helped several school districts cope with tough budgetary restraints. In Irvine, California, Community Cablevision produced a telethon for the "Irvine Education Foundation" that raised over $20,000. In Lowell, Massachusetts, Lowell Cable TV airs a yearly telethon that has raised over $30,000 for a regional Catholic high school.

Through Cable in the Classroom, the donation of equipment and professional support services, Colony Communications and the cable television systems we operate plan to continue to support local school systems and distance learning.

VI. CONCLUSION

Cable television is a key component of our nation's flexible, hybrid telecommunications infrastructure. It contributes to education through the efforts of program networks like The Discovery Channel and MEAJ, the efforts of operators like Colony Communications, and industrywide initiatives like Cable in the Classroom. Through its use of fiber, coaxial cable, and satellite technologies, cable enables teachers to transcend classroom walls and allows geographically isolated students access to learning. Moreover, the cable industry enables all Americans to continue their education at their own pace by providing programming which gives people the ability to earn as little as a single high school credit or as much as a graduate degree—as their needs dictate. In remote areas where cable systems are not accessible, cable programming can be distributed through alternative, satellite-based technologies.

While the cable industry will become an increasingly important participant in our nation's efforts to expand educational opportunities, it does not claim to be the only player. Each technology has its own role, and each should be encouraged to develop education through its own initiative and in partnership with other industries. Rather than pick individual winners and losers, the federal government should focus on providing the funds, equipment, teacher training, and interstate coordination required to bring learning to all Americans. As it deploys state-of-the-art fiber and satellite technologies and extends the reach of its program networks, the cable industry will be a key contributor to our nation's goal of making instructional programming and continuing education universally available.

Senator INOUYE. I thank you very much, Mr. Clifford. May I now call on Mr. Morgan.

STATEMENT OF DAVID MORGAN, DIRECTOR, NETWORK DESIGN, SAN MARCOS TELEPHONE CO.

Mr. MORGAN. Good morning, Mr. Chairman and members of the subcommittee. My name is David Morgan. I am both director of network design for San Marcos Telephone Company and also executive director for Telecor Televideo. I appear today before the subcommittee on behalf of the San Marcos Telephone Co. and also the United States Telephone Association.

I am here representing telephone companies and the role they play in the delivery of instructional materials and training over distance. Recipients of this instruction and training include schools, universities, businesses, and community partners.

Mr. Chairman, San Marcos Telephone Co. offers as an example a successful telecommunications based distance learning model that can be replicated in other communities. The San Marcos Telephone Co., using state-of-the-art technologies, has given direction and set the pace for the model's development. The success can be attributed to having in place a fiber optic transmission infrastructure and to viewing the development process as education looking at technology and not technology looking toward education.

This model, known, as the TeleCommUNITY Network, is located in San Marcos, TX, and derives its purpose and strength from the partnership formed by the four local groups. The San Marcos Telephone Co. partnered with Southwest Texas State University, the San Marcos School District, and the Gary Job Corps Center to create a unique model network for interactive education and training.

The TeleCommUNITY Network is the only fully digital, multisite interactive fiber optic based network in Texas serving community partners. The partners have unique agendas but common needs.

Among these needs, the San Marcos School District is mandated by the State to provide programs that reflect excellence, access, and equity resources. The Gary Job Corps students need access to other community educational resources. Southwest Texas State University is interested in furthering education research and increasing outreach to community members. The San Marcos Telephone Co. wants to understand and help satisfy lifelong educational needs that will help derive future technical developments to the network and that will help to bring new economic development to the area.

All partners recognize the need to move information and not move the people. In the TeleCommUNITY Network, the partners needs focus on finding educational solutions via a telecommunications-based fiber optic network. State of the art broadband digital switching and transmission equipment delivers DS–3, full motion two-way interactive video with simultaneous voice and data capabilities to each site or multiple sites.

Groups of learners at each site can see and hear students and instructors at other sites simultaneously and in real time. Distance learning at these sites is more than just face to face interaction. Multimedia computer based learning stations network together, allow students and teachers to actively engage in the learning process.

The system allows dual credit enrollment for high school students taking college courses for both secondary and postsecondary credit. Inservice and professional development includes collaborative efforts between university professors and high school student teachers, team teaching at a distance. Gary Job Corps students who previously only had access to a GED now can participate in high school classes and receive high school credit toward a diploma.

A notable educational success this past semester via the network has been documented in our PATH mathematics classes—56 at risk students from the community have participated in these classes. These classes are situated in the high school but are taught remotely from the university in a collaborative effort. These students have been introduced to pre-Algebra skills and other higher order skills related to computational tasks.

The results indicate that participating students have consistently improved their performance in math, are attending class on a more regular basis, and have an improved attitude toward school in general. An increasing level of competency in reading, writing, and computational skills in the local workforce will permit citizens to better compete for jobs and will enhance and maintain current economic standings in the community.

Neither the San Marcos Telephone Co. nor its partners view the TeleCommUNITY Network as a philanthropic exercise. It is a sound business decision on my company's part, and an appropriate mutually beneficial cost of education on the part of our partners.

If I leave the subcommittee with a single message today, it is that public/private partnerships in education cannot be contingent on charity. Only market rewards for both the public and private partners will ensure success and continuity. Our network is driven by needs, not technology; by people not by systems.

It is imperative to understand this process in order to provide the most appropriate solution to these lifelong learning needs. As a collaborating partner in the development of the TeleCommUNITY Network, San Marcos Telephone Co. is avoiding the syndrome of the technology dump where in-kind technologies—donations define the solution before considering the actual educational needs of the partners.

The experience with the TeleCommUNITY Network has shown that for continuing success, there must be local champions within all of the partnering organizations. Energy and vision must be long term and sustained after the initial establishment of the system.

The San Marcos Telephone Co. felt the responsibility toward schools and community, to provide a supportive environment in which schools and their partners may explore new uses of technology for education and training. The TeleCommUNITY Network is real and it works. The results are measurable. Everyday lives are being changed and educational paradigms challenged.

As part of this testimony I am including an appendix 1, which describes in more detail the teleCommUNITY Network and its future expectations. Special note and consideration should be given to the sections on economic development, linking for literacy, research and development, collaborative efforts, closing the gap, reaching partners across the State and beyond the local network, and the San Marcos Network technical issues updates.

In these sections initiatives concerning alternative technologies, electronic equity, funding for networks, corporate training, workforce skill set requirements, continuing education, and lifelong learning opportunities are explored.

In Appendix 2, are descriptions of efforts submitted by other telephone companies in the area of distance learning.

Mr. Chairman, the telephone industry is well positioned to provide leadership and meet their customers' needs, including the need for distance learning. Using both existing technologies and those technologies which will be fostered by a visionary national telecommunications policy, exchange carriers can take the distance out of distance learning. The concept of distance can be made transparent to the end recipients if the applications meet their needs and stimulate learning.

To maximize results, these transmission facilities, serving as information highways, must be rapidly augmented if the needs are to be met in many areas of the Nation. Fiber optic cable deployment must be an option of choice by the facility providers.

Finally, partnerships of education and transport providers must be supported by appropriate funding for education and encouraged by a favorable national telecommunications policy. If we are to advance and find new and unique ways to teach and reach our young people, we must put aside the barriers which stand in the way of their progress.

The technologies used in the teleCommUNITY Network are not unique. However, the applications used on that network and the implications for the students, the teachers, and their families in San Marcos are significant.

Mr. Chairman, I thank you and the members of the subcommittee for this opportunity and look forward to your questions.

[The prepared statement of Mr. Morgan follows:]

PREPARED STATEMENT OF DAVID J. MORGAN

BACKGROUND

Good morning, Mr. Chairman and members of the Subcommittee. My name is David Morgan and I am both the Director of Network Design for San Marcos Telephone Company and Executive Director of Telecor Televideo. I appear today before the Subcommittee on behalf of both the San Marcos Telephone Company and the United states Telephone Association (USTA).

USTA represents the more than 1100 local exchange carriers who provide telecommunications services to over 98 percent of the access lines in the United States. USTA members range from large publicly-held corporations to family-owned companies.

San Marcos Telephone has 22,000 access lines serving the San Marcos, Texas vicinity, population 60,000. Telecor Televideo, a division of San Marcos Telephone, is a consulting group specializing in two-way interactive video and multimedia networks for schools and their partners.

Finally, and perhaps most importantly, I testify as the father of three, who seeks to assist educational institutions to convey in an audio visual medium, that form of media most readily accepted by our nation's youth, their instructional messages.

I. INTRODUCTION

My testimony seeks to describe the role telephone companies are currently playing in the delivery of instructional materials and training over distance. I also seek to outline that while current recipients of this instruction and training are schools, universities, businesses and community partners, future recipients could be individuals at home.

II. TELECOMMUNITY

San Marcos Telephone Company would offer its program, "TeleCommUNITY," as an example of a successful telecommunications based distance learning model. One which can be replicated in other communities.

San Marcos Telephone Company, using state-of-the-art technologies, has given direction and set the pace for the model's development. Our success can be attributed to having in place a fiber optic transmission infrastructure, and to viewing the development process as one in which education looked to technology -- not one in which technology looked towards education.

The TeleCommUNITY network, the only fully digital, multi-site interactive fiber optic-based network serving community, not business partners, derives its purpose and strength from the partnership formed by four local groups: The San Marcos Telephone Company, the Southwest Texas State University (22,000 students), the San Marcos School District (6,700 students), and the Gary Job Corps Center (2,000 students).

A. Needs and Goals

While each of the partners has unique agendas, we all share common needs. These needs and goals include:

- The San Marcos School District is mandated by the state to provide programs that reflect excellence, access, and equity of resources;
- Gary Job Corps students need access to other community educational resources;
- Southwest Texas State University is interested in furthering research and increasing outreach to community members; and
- San Marcos Telephone Company seeks to understand life-long educational needs, which will drive future technical development on the network, and which help to bring additional economic development opportunities to the area. Finally all of the partners recognized the need for a network which allowed for the transport information not people.

B. Results

In TeleCommUNITY, the partners focused on finding education solutions via a telecommunications-based (fiber optic) network. The result is in state-of-the-art broadband digital switching and transmission equipment delivers (DS3) full motion two-way interactive video, with simultaneous voice and data capabilities to each site or to multiple sites. Groups of learners at each site can see and hear students and instructors at other sites, simultaneously and in real-time. Distance learning at these sites is more than just face-to-face interaction. Multimedia computer-based learning stations, networked together, allow teachers and students to actively engage in the learning process.

Specific benefits resulting from the system include:

- dual credit enrollment for high school students taking college courses for both secondary and post-secondary credit;
- Inservice and professional development includes collaborative efforts between university professors and high school teachers team teaching at a distance;
- Gary Job Corps students who previously only bad access to a GED, now can participate in high school classes and receive high school credit towards a diploma; and
- PATH Math classes

PATH or Partnership for Access to Higher Mathematics provides a analytical analysis of the benefits of the network. Fifty-six "at risk" students from the community participated in the classes. The classes, situated at the high school site, but taught remotely from the Southwest Texas State University in a collaborative arrangement, introduced to pre-Algebra skills and other higher-order skills related to computational tasks. The results indicate that participating students have consistently:

- improved their performance in math;
- attended class on a more regular basis; and
- improved attitude toward school in general.

III. COSTS

The cost for seed capital for deployment of the network was borne by the shareholders of San Marcos Telephone Company.[1] Each of the partners will be assessed a monthly charge against the balance of the capital costs as well as a time sensitive usage fee, established pursuant to a contract.

Neither San Marcos Telephone Company nor its partners view TeleCommUNITY as a philanthropic exercise. It is a sound business decision on my company's part and an appropriate and beneficial cost of education of the part of our partners. If I leave the Subcommittee with but a single message today, it is that public private partnerships in education be they for traditional or distance educational programs can not be contingent upon charity. Only market rewards for both the public and private partners will ensure success and continuity.

IV. COMMUNITY BENEFITS

The TeleCommUNITY Network is also being used as a tool in the community, focusing on such needs as work place literacy, i.e., activities for work skills, literacy programs, school-to-work transition, and other activities related to economic development. Increasing the level of competency in reading, writing, and computational skills in the local work force will permit citizens to better compete jobs, and will enhance and maintain current economic standings in the community.

V. NATIONAL LESSONS

The most important lesson Congress and others may learn from TeleCommUNITY is that the distance learning network must be driven by needs, not technology; by people, not by systems.

As a collaborating partner in the development of the TeleCommUNITY Network, San Marcos Telephone Company is avoiding the syndrome of the technology "dump", where "in-kind" technology donations define the solution, before considering the actual educational needs of the partners.

Additionally, the experience with the TeleCommUNITY Network has shown that for continuing success, there must be local "champions" within all the partnering organizations. Energy and vision must be long term and sustained after the initial establishment of such a system. San Marcos Telephone Company felt the responsibility toward the schools and community, to provide a supportive environment in which schools and their partners may explore new uses of technologies for education and training.

The TeleCommUNITY Network is real and it works. The results are measurable. Every day, lives are being changed and educational paradigms challenged.

VI. APPENDIXES

Attached to this as Appendix 1 is a detailed description of the TeleCommUNITY Network and its future expectations. Special note and consideration should be given to the sections on Economic Development—Linking for Literacy; Research and Development—Collaborative efforts; Closing the Gap—Reaching Partners across the State and Beyond the Local Network; and, the San Marcos Network—Technical Issues Update. In these sections, initiatives concerning alternative technologies, electronic equity, funding for networks, corporate training, work force skill set requirements, continuing education, and lifelong learning opportunities are explored.

In Appendix 2, are descriptions of efforts by three other telephone companies in the area of distance learning: NYNEX, Ameritech and BellSouth.

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[1] Any costs not found to be part of the San Marcos local exchange network were borne by the shareholders.

VII. CONCLUSION

The telephone industry is poised to provide leadership to meet our customers' needs, including the need for distance learning networks. Using both existing technologies and those technologies which will be fostered by a visionary national telecommunications policy, exchange carriers can take the distance out of distance learning. We understand that to meet educator's needs and stimulate learning, the concept of distance must be made transparent to the end recipients. To maximize the results, transmission facilities serving as "information highways" must be rapidly augmented if the needs are to be met in many areas of the nation. Fiber optic cable deployment must be an option of choice by facility providers and an environment to support fiber deployment must be the goal of policy makers.

Finally, partnerships of educational and transport providers, must be supported by appropriate appropriations for education and encouraged by a favorable national telecommunications policy.

Mr. Chairman, thank you and the members of the Subcommittee for your time. I look forward to your questions.

[Appendix 1—Telecommunity Network: The San Marcos Project and Appendix 2—Other Telephone Industry Initiatives: NYNEX, BELLSOUTH, AMERITECH, PACIFIC BELL, AND GTE may be found in the committee files.]

Senator INOUYE. I thank you very much, Mr. Morgan. Before I call upon Mr. Schoenherr, I would like to acknowledge a note that I received from the Senator Bentsen. As you know, he is a very important member of this committee, but at the present time he is very busy on the floor speaking on the supercollider. So, he has to set his priorities here. [Laughter.]

But he has a paragraph here I think I should read:

> Please extend a special welcome to my dedicated constituents who have travelled here from Texas to participate in this important hearing: Mrs. Kay Abernathy of Beaumont and Mr. David Morgan of San Marcos. I am very proud to know these individuals are at the forefront of the local and national dialog on the use of telecommunications in education, and I applaud their efforts.

I thought you would like to hear that, sir.

Mr. MORGAN. Yes, thank you, Mr. Chairman.

Senator INOUYE. And now, Mr. Schoenherr.

STATEMENT OF RON SCHOENHERR, SENIOR VICE PRESIDENT, SOUTH CAROLINA EDUCATIONAL TELEVISION COMMISSION

Mr. SCHOENHERR. Yes. I am Ron Schoenherr, senior vice president of the South Carolina Educational Television Network and deputy director of that system.

The mission of PBS was built on an educational foundation since its very inception. The infrastructure is already in place with 341 public television stations and 32 State networks working locally, regionally, and nationally on education reform.

Before President Bush even announced the six national education goals, public broadcasting was already able to demonstrate that they were working on all six of them. As early as 1950 we were using technology to put the best teachers in classrooms across America to foster equity and to create otherwise unavailable opportunities for learning to American students.

Today, public television is making a real difference for millions of Americans of all ages, from birth right to our senior citizens. In the area of early childhood education, public television is actively working on the first national goal, helping children attain readiness to learn with projects like the congressionally funded Early Childhood Professional Development Network.

Launched this year in my State of South Carolina, South Carolina ETV, in cooperation with public television stations around the country, will deliver satellite-based interactive training and resources to Head Start teams working with Native Americans, migrants, Alaska village children, and others in 13 States.

For more than a decade, South Carolina ETV network has been producing and furnishing quality training tapes to child care workers and parents. These videos have been distributed statewide, nationally, and internationally, through a partnership with the National Association for the Education of Young Children, which has a national membership of over 90,000 early childhood professionals.

Public television plays a part in educating students in K through 12—83 percent of public television stations devote an average of 5 hours a day to instructional television. They reach almost 70,000 students—1.8 million teachers, and 29 million students.

Public television also pioneered the use of satellites to send students educational opportunities, mostly notably SERC, the Satellite Educational Resources Consortium, part of the Star Schools Program. SERC is a breakthrough for education in reaching educational goal four, achievement in math and science, with courses like precalculus, discrete mathematics, physics, Russian, Japanese, world geography.

South Carolina Educational Television produces the Russian course, as well as two of the math courses. It uses computer technologies and telephone technologies to hook students, including those in geographically and economically disadvantaged areas, who can interact with a studio instructor and their fellow students in 23 participating States.

Sixty percent of SERC students are rural; 71 percent are eligible for chapter 1 funds. These statistics demonstrate the power of public television to overcome economic and geographic barriers via satellite technology.

Public television is also working with adults as well. The Corporation for Public Broadcasting report shows 60 percent of students will be pursuing studies outside the traditional classroom setting by the end of the decade. In my State of South Carolina, the University of South Carolina awards more MBA's to students through television than in traditional classes.

Professional development training and resources are made available to teachers through a variety of projects, like the teacher training institute headed by WNET in New York and funded by Texaco. It uses master teachers to train other teachers in the most effective use of video in teaching science. Science teachers train in the institute then go back to their own districts and train teachers on a local level.

At South Carolina ETV we broadcast staff development programming into each school everyday from 3 to 4 o'clock, with additional resources on our educational radio network. Last year teachers took advantage of 795 different programs.

In the area of literacy, public television has responded to the illiteracy issue with projects like Project PLUS, Project Literacy U.S., a collaboration of public broadcasting and ABC.

Kentucky ETV created GED on TV and the Learn to Read series because one-half of Kentucky citizens did not have a high school diploma. Technology as an educational tool is at the heart of these services, and public television is the core of their development.

In South Carolina the Instructional Television Fix Service, or ITFS, feeds programming to public schools, State agencies, law enforcement centers, technical colleges, and hospitals throughout our State. My State is also using technology to let rural school districts share faculty, making essential math and science courses available in even the most remote school districts.

PBS's Telestar 401, funded by Congress and on schedule to become operational in late 1993, will be America's education satellite. We will be using up to 6 transponders, each able to provide up to 20 channels simultaneously. The PBS satellite can provide the distribution and the public television stations located throughout America can provide the instruction in partnership with many.

Public television has a track record for education. For the first time ever, because of the technology now available to us, we can make quality education on any subject equally available to every child in America. The goal that most thought impossible is now financially and technically within our reach.

The only thing standing in our way is whether we have the will, the determination, and the courage to engage in the difficult process of bringing about change. I believe that we do. We at South Carolina Educational Television and all of the public broadcasting community look forward to working with you to create the classroom of the future, thanks.

Senator INOUYE. I thank you very much, sir.

Mr. Clifford, I am sorry I was not here to listen to your testimony, but I gather you are in the cable business. [Laughter.]

Mr. CLIFFORD. Yes, sir. The company I represent is called Colony Communications and I am the chairman and CEO of that company.

Senator INOUYE. What sort of programming do you have on your stations, educational?

Mr. CLIFFORD. We carry the general variety that cable television systems offer, but the Learning Channel, Discovery, Arts & Entertainment, BRAVO, the CNN—both CNN news services and a variety of others that have educational components are provided on our cable systems.

In addition, my company and myself—I happen to be one of the founding members of Cable in the Classroom and I have sat on its executive committee, still do, and its board of directors since its inception. I was there when we began the process.

So, we in our communities, along with the vast majority of other cable operators now in the United States, provide Cable in the Classroom, which is not a direct programming service, but it is a service that offers to the classroom teacher enrichment programming from cable television that they can use that is copyright free and freely available to them for their use on a limited basis in the classroom.

We sponsor that and provide that in all of the systems that we operate. We are in 9 States across the country, approaching about 800,000 subscribers, and are one of the larger companies in cable.

We have training programs in our company—as do most of the other people involved in Cable in the Classroom, if not all—whereby we teach—provide at our cost seminars for teachers to learn how to use this programming, how best to take advantage of it. And we provide material that tells them on a monthly basis what programs are available at what time, so they can prerecord them. And in many instances we provide the recording equipment as well.

At this point it has been quite successful. We have hundreds—in fact tens of thousands of teachers have gone through the training programs nationally. And in our company, many many hundreds have gone through the training programs which we conduct on a regular basis.

We have full-time employees that we have put on staff at our company, as have other cable operators, from the educational field to supervise the process of encouraging teachers to take advantage of this program.

Distance learning is a marvelous opportunity, but it is not a substitute for in-classroom educational process. I am not here to pronounce that distance learning is not important; it is very important. But Cable in the Classroom, in our opinion, takes advantage of the best environment that is available for teaching, that is the classroom. The interplay between students, the peer group pressure, the competition that is developed. Good competition in the classroom is essential, overall, to the learning process, in my opinion.

I have had the good fortune to be married for 34 years to the same young lady who is a teacher. My sister taught high school and was a professor at Scottsdale Community College and was associate dean of students at Phoenix College for a number of years and just retired. And I have the very good fortune of having a mother-in-law who rose to an administrative post in education in Phoenix, AZ, in the high schools.

And I was going to teach school, but somehow got trapped into the broadcasting business which led me into cable TV. But it has been my clear experience that Cable in the Classroom, assisting in the classroom, enriching the classroom experience and helping teachers better educate in the classroom, is the most successful form of programming that we can provide.

Distance learning is a superb idea for those highly motivated people who cannot have that experience, and it should be provided. But it is not a substitute for the classroom activity.

Senator INOUYE. Did I hear that the training program and the training guides are provided by your company at no cost to the educational system?

Mr. CLIFFORD. That is correct.

Senator INOUYE. Congratulations, sir.

Mr. CLIFFORD. Thank you.

Senator INOUYE. Mr. Morgan, in listening to your testimony, am I correct to assume that the activities you are involved in with the university are part of your philanthropic efforts?

Mr. MORGAN. The efforts we have with Southwest Texas State University—currently, San Marcos Telephone Co. has provided the initial capital for the infrastructure and also providing for the classrooms. As I also mentioned, the various partners we have—not only Southwest Texas State University but also Gary Job Corps and also the high school—are providing renumeration to the company, but also looking at being able to provide, in particular, their own facilities, additional increases in the uses of the facilities.

There have been several new applications that have been developed by the partners themselves. In particular Dean Beck, who is the dean of the department of education, is preparing a particular classroom which will be compatible to the other sites we currently have, which will be used by his own staff for teaching, but also being used by student teachers being able to have, then, direct access to the classrooms that are currently available.

Senator INOUYE. Is this type of community relationship commonplace in the telephone industry?

Mr. MORGAN. I would say there are many working partnerships between telephone companies, educational institutions, and other community partners, yes.

Senator INOUYE. And is this commonplace in the cable industry, what you described?

Mr. CLIFFORD. Yes, I would say so. We have many associations and relationships with a variety of other providers and educational institutions for the purposes of providing this kind of service.

Senator INOUYE. Mr. Schoenherr, I am well aware that South Carolina is one of the great pioneers in this endeavor, and I wish to congratulate you. Are these teaching aids very expensive?

Mr. SCHOENHERR. Teaching aids? Not really, compared to the fact that we can reach remote locations and we can go to inner cities. We do partnerships with business and industry as well, in order to make what we have done in South Carolina happen. And we do not feel it is a very large price tag.

Senator INOUYE. Some have suggested that we should have a separate satellite dedicated strictly to educational television. Do you think that makes sense?

Mr. SCHOENHERR. I think basically we already have that in place with the Telestar 401. We have access to 6 transponders with that, and with the new video compressions that are available you can split those transponders into 20 channels for each transponder; that would be 120 channels.

There is more access on Telestar 401 for future expansion, and I would agree with some of the previous panel members and also Senators here what we need to look at is the programming and make the programs all high quality. I do not think we need another satellite, no.

Senator INOUYE. Do we have sufficient programming? I gather from what you say, we do not.

Mr. SCHOENHERR. I think we are developing new programming. It has been pointed out that many of our, for instance, college teachers who come out of our colleges are not trained in the use of technology. That is another particular area that needs a lot of work, and we certainly can develop that. There are also quality child care programs, quality teacher training programs that are in existence that we just need to funnel into one system.

Senator INOUYE. As chairman of this committee, I spend about 12 hours a week flicking through various channels, and I notice that there are many educational-type programs even at midnight, but they are generally targeted for college-type education. Besides Sesame Street and a couple of others, do we have any for children?

Mr. SCHOENHERR. Yes. We have Mr. Rogers' Neighborhood. We have Sesame Street. We have several new projects that are on the drawing boards for premiering this year: Ghostwriters. We have a series of national scholastic programs that hopefully will develop a sense for science and teacher education. There are a number of new programs being invented as we speak.

Senator INOUYE. Besides Mr. Rogers and Sesame, there are not too many, because we just funded Ghost Riders.

Mr. SCHOENHERR. Are there enough? The answer is no. Is it expensive? The answer is yes. And I think a lot more can be done. I think there are some collaborations with other entities that could make additional programs available to the system.

Senator INOUYE. You spoke of assisting Native Americans and migrants. What sort of program would that be?

Mr. SCHOENHERR. Under health and human services, Congress funded the Early Childhood Professional Development Network, a project to train Head Start workers and the primary interest in the legislation was in migrant camps, native Americans and also Alaskan villages and we have worked in collaboration with public television stations and universities to make the satellite delivered training to Head Start teachers available, and that will improve their skills and also meet the requirement for some of their certification which Congress required, I believe in 1994. They are required to take a certain amount, I believe 36 hours of training and this will provide that training for them.

Senator INOUYE. Thank you very much.

Senator Burns.

Senator BURNS. Thank you, Mr. Chairman. One question for Mr. Clifford and Mr. Morgan, mostly Mr. Clifford I would imagine would have more interest in this than anybody else because we have before us S. 12, and the cable regulation bill.

Should passage of that bill in its present form now impact your idea or your distance-learning programs by cable television?

Mr. CLIFFORD. The passage of the current proposed legislation in my opinion would have a serious impact on the ability of cable operators to fund these kinds of programs. The draconian aspects of these bills, which are in my opinion so punishing to the industry, that we would be in a position where we would have to reconsider a lot of the economic goodwill that we can invest in this kind of community project.

It would be our intent at Colony Communications and I believe that is the intent of most cable operators, to continue to do the very best we can to serve our communities. I can go on and on about the philosophy behind that, but it is just an obligation and a responsibility that any citizen in this country would want to fulfill, primarily out of self-pride and self-interest and wanting to develop a community that is viable, that can take advantage of your service, so it is good business.

But the bill, the legislation that is proposed in my opinion is so contradictory and we could go on and argue about that I guess from now until the end of the Earth, so contradictory in its components that on the one hand it wants more service, on the other hand it prevents rate increases, on the other hand it asks for more of a contribution, on the other hand it does not provide the economic goodwill to do it.

So, my answer to you, in the long form I have given, and in the short form, I think it is negative and it will have some impact negatively on these programs.

Senator BURNS. I guess the point I was trying to make is that through the OTA study, that policy uncertainties by this government makes the future look a little bit dim when we come to the problem of trying to draw some plans.

Mr. Schoenherr, I was interested in your Telestar 401 and a bit on the critical side on the initiative that I have introduced in this Congress, and I have a couple of questions for you that I think should be made for the record and that is, with regards—and I want to commend you, South Carolina has absolutely been a national leader in this area of trying to reach out in the education sector for a long, long time.

So, you are not without vision and dedication to what we are trying to do, provide those tools. And I, as one Senator, is very appreciative of that. With regard to Telestar 401 now we have right now around 111, I think the last count of educational programs, institutional program providers, and they need a way to get access to classrooms but we have some very—people with a lot of imagination. They are very inventive to do these things, and yet they are denied access due to a variety of things.

And I would ask in Telestar 401, is that going to be dedicated solely to educational and instructional users or will educational users be competing for transponder time with PBS programmers?

Mr. SCHOENHERR. As I understand it, there are a certain number of transponders set aside for the national distribution of PBS programming and related services such as the PBS adult learning service.

Additional time, additional transponders are going to be made available to public broadcasting institutions including those like South Carolina Educational Television to access those transponders on a space available basis.

The comment that I made in my testimony was the fact that the Telestar 401, even though there are only six transponders allocated at this time. They are expandable. So, from my own personal view, I cannot see putting up another bird with another 6 transponders with digital compression to have another 120 channels when we have PBS Telestar 401 available right now or in the fall of 1993.

Senator BURNS. I would footnote with that, how many educational institutions out there do you think has the equipment to decode compressed signals?

Mr. SCHOENHERR. That is the problem that many institutions including our schools have. In South Carolina for instance our schools have a four channel distribution system within each school, so no matter how many channels there are up there on the satellites floating around, 120, 320, 3,000, they are only going to be able to select 4 of those at one time.

So, I think it is a problem of getting the local institutions, colleges, universities and schools to be able to have access to funds for that equipment, and that is not available in most cases through many of the foundations. They fund programs but they do not fund equipment.

There are limited funds available through NTIA and other programs for equipment but it is not enough.

Senator BURNS. I guess what I am driving at is this: Will Telestar 401 serve as a neutral infrastructure on which any programming can be broadcast or will programmers be subject to CPB or PBS oversight and programming approval?

Mr. SCHOENHERR. I believe that general access could be made available. It is currently designed for PBS and PBS related programming. That is not to say that it could not be extended to common access by any entity.

Senator BURNS. Given that schools and educational institutions are limited by annual budgets, will PBS enter into a short-term, maybe 1 or 2 year agreements, ensuring programmers nonpreemptable time?

Mr. SCHOENHERR. I do not have an answer for that, really.

Senator BURNS. Does Telestar 401 have sufficient capability to meet the needs of instructional programmers this time or does PBS have to rely on digital compression to provide that capacity? I think you have already answered that.

Mr. SCHOENHERR. It is a digital compression system and there are sufficient channels with the six transponders that exist right now.

Senator BURNS. Thank you very much, Mr. Chairman. I have no further questions, and by the way, thank you very much for coming and congratulations on what you are doing. I believe in it. I do think that we have to take a look and find that neutral ground to provide outlets for programmers and that is the principal force that is driving my interest in a separate educational instructional television satellite.

So, thank you very much, Mr. Chairman.

Mr. SCHOENHERR. We understand that, and all I am saying is that I think if we sat at the table we could come up with a compromise without spending another $20 million on another satellite.

Senator INOUYE. Thank you very much. May we submit questions to the panel and request your consideration of them?.

Mr. SCHOENHERR. Yes.

Senator INOUYE. Thank you very much, gentlemen.

Our next panel consists of the executive director of the Missouri School Board Association, Dr. Carter Ward; a teacher from Beaumont Independent School District in Beaumont, TX, Ms. Kay Abernathy; the provost of Maui Community College, Dr. Clyde Sakamoto; teacher in the Cold Springs Elementary School, Missoula, MT, Mr. John Kuglin.

The panel wanted to have Mr. Kuglin begin the testimony, but since he is not here at this time, may I recognize Dr. Ward.

STATEMENT OF CARTER WARD, Ph.D., EXECUTIVE DIRECTOR, MISSOURI SCHOOL BOARDS ASSOCIATION

Dr. WARD. Thank you, Mr. Chairman, and members of the committee.

I want to say thank you for the opportunity to be here and share with you some thoughts on distance learning from the perspective of the Missouri School Boards Association and the Education Satellite Network.

Although there appears to be little agreement regarding the changes which need to occur in education, there does seem to be a consensus that change must occur if America's youth will be properly prepared to compete in the world of the 21st century.

Two significant elements exist today which when combined provide a dynamic catalyst for meaningful change in education. The first element is the solid commitment to school improvement exemplified by the national goals. The second important element is the ability to apply existing and future technological solutions to accomplish these goals.

The combination of having a clear vision and the technological wherewithal provides a great opportunity to bring about positive change in public education. The Missouri School Boards Association established the Education Satellite Network to ensure that all children regardless of school district size or location have equal access to instructional and enrichment opportunities through high quality, satellite delivered educational television programming.

It is rare that a school board association would take this initiative. Traditionally, the role of the school board has been to provide resources to teach the community's children. From securing resources to building the one-room schoolhouse, buying books, and hiring the teacher, the school board was responsible for making sure students had opportunities to learn.

While the times have changed and schools have gone from one room to multiple buildings, the role of the board remains the same, and that is to provide the necessary resources to help students learn.

The Education Satellite Network is a resource which has been incorporated in today's schools, providing access to and information about programs from the Nation's top providers, ESN allows educators to incorporate the most up-to-date, timely information into their curriculum, selecting those programs which meet specific needs of the district, thus providing students with every opportunity to be successful in the 21st century.

Serving as a clearinghouse of program information, ESN publishes the ESN program guide monthly, September through June. In the materials which I distributed to the members of the committee, you should have received a copy of the monthly program guide.

This program guide includes program listings, descriptions, air dates and times for programs produced by ESN, and other producers across the country. It also includes listings of cable type programming.

In 1991 ESN listed over 100 hours per month of staff development and teacher in-service teleconferences and programs in this program guide for educators. Over 1,700 staff development and teacher in-service programs have been included in the 1991 and 1992 issues.

The Education Satellite Network has become a recognized producer of board training, staff development, teacher in-service and student enrichment programs. ESN produced and uplinked over 40 hours of original programs and teleconferences during the 1991–92 school year, including over 17 hours of programs specifically aimed at equipping school board members to meet the challenges facing education today.

ESN is committed to restructuring America's public schools through a comprehensive nationwide in-service program targeting the adults within the education community including school board members, administrators, teachers, and other professional and support staff.

ESN is pursuing this expansion of programming with partial financial support from the U.S. Department of Energy and with the support of the Network for Instructional Television, a group dedicated to providing instructional television services to many of the Nation's largest urban centers. Nine prominent national education organizations are also lending their support to this expansion effort.

In light of several factors, including the 1983 Nation at Risk report and subsequent reports calling attention to the peril of American public education, the establishment of the six national goals for education and the movement toward national standards for both teachers and curricular issues, the Education Satellite Network would recommend that the Federal Government reevaluate its historical and traditional role of providing minimal financial support to public elementary and secondary education.

If excellence in education is indeed a national issue, and is the foundation upon which we can build this country economically and socially, then it is critical that we commit our very best resources to addressing this need and to make education our Nation's No. 1 priority.

Aristotle summed it up very quickly and succinctly when he stated, "all who have meditated on the art of governing have been convinced that the fate of empires depend upon the education of youth."

ESN encourages Congress to give serious consideration to extending Government grants beyond a 1- to 2-year period, which often eliminates or limits the effectiveness of the project. Three- to 5-year funding of projects would ensure greater stability and enable worthwhile projects to increase their potential to becoming self-sustaining.

Consideration should also be given to providing additional funding to projects that have clearly demonstrated effectiveness and which are central to accomplishing the national education goals.

Due to the unnecessary costs caused by lack of standardization in technologies, as well as the limited resources available to the public schools themselves for the acquisition of technology, it would also be advantageous to develop a standard for satellite communications as well as other telecommunications technologies so that schools can receive maximum benefits with minimal investment.

Achieving the national goals for education is critical to ensuring our freedom and our prosperity. These goals cannot and will not be accomplished without imaginative and skillful integration of technologies within the educational process.

On behalf of the Missouri School Boards Association, the Education Satellite Network and the entire education community, I would like to thank members of this subcommittee for addressing this most critical issue.

Senator INOUYE. Thank you, Dr. Ward. Instead of waiting until all the panelists have completed their testimony, I would like to ask each witness individually about uniqueness of each project as we proceed.

ESN is a Missouri project?

Dr. WARD. That is correct, sir.

Senator INOUYE. And the State finances that?

Dr. WARD. The Missouri School Boards Association is a not-for-profit corporation and represents local school boards. We are not a State agency per se, but through our membership and through our desire to provide equity in terms of access and opportunity to the students that our boards represent, we have developed the Education Satellite Network and have subsequently received funding through both NTIA and through one of the Star Schools awards.

Senator INOUYE. How much does it cost to operate your system?

Dr. WARD. Schools in Missouri pay $850 a year to be a subscriber for the support offered through ESN.

Senator INOUYE. And are you now exporting this programming to other States?

Dr. WARD. Yes, we are, sir. We have schools in 15 to 20 States participating in ESN, and then in addition to that we have schools in over 40 States receiving this publication called the ESN Program Guide.

Senator INOUYE. And all the programming is produced in Missouri?

Dr. WARD. No, we produce some of this programming, but as far as the program guide is concerned, we have cooperative agreements with almost all of the awardees of Star School funding to provide us their programming schedule, so that we try to provide a comprehensive, all inclusive listing of the educational programming that is being offered. Obviously, it has to be edited somewhat because of the magnitude of what is out there. But we try to do our best in representing the best of what the producers have to offer.

Senator INOUYE. Well, congratulations, Dr. Ward.

Dr. WARD. Thank you.

Senator INOUYE. Senator Burns.

Senator BURNS. May I ask——

Senator INOUYE. Would you like to introduce our next witness?

Senator BURNS. I would be happy to. I just want Dr. Ward to go back to Columbia, MO, and an old roommate that I had in college, get him healthy so he can start winning basketball games again. [Laughter.]

Norm Stewart is a good personal friend of mine.

Thank you, Mr. Chairman. Mr. Kuglin, who is from Missoula, MT, who has developed a classroom technique and has come to tell us about it and how distance learning and the tools that he uses to I think probably demonstrate what this is all about this morning. So, we welcome you, Mr. Kuglin. It is a long way from Missoula, MT, and thank you for coming, and bringing your very special guest, by the way.

STATEMENT OF JOHN KUGLIN, TEACHER, COLD SPRINGS ELEMENTARY SCHOOL, MISSOULA, MT

Mr. KUGLIN. Thank you, Senator Burns and Mr. Chairman. I guess this is the definition for real distance learning, being able to travel from Montana to Washington, DC. If we could do that for all of our kids we would really have something to talk about.

I am happy to be here, and I come to you as a classroom teacher on a grassroots level. I have been teaching for 20 years in Missoula. I have also had the opportunity, and I hear in many of the testimonies that teacher education is so important, to teach over 300 of my fellow colleagues back in Missoula technology courses, thus trying to implement the technology that is currently available in schools. I have even traveled to a couple of school sites in western Montana to work with the equipment they have in their schools, and in many cases reorganizing the schools and showing them what they could do with the available technology.

But the reason that Kayla, Jason, and I are here today is to talk to you about cable television working in our classroom through the Cable in the Classroom Project. When I am done with our short presentation, I hope to give you a feel for the programming that is available, what the infrastructure is to get it into the classrooms, and a thumbnail of what it looks like when it is actually in place.

As you heard earlier, the Cable in the Classroom Project was formed in 1989, the year of the fall of Eastern Europe, as you might remember. My fourth graders were there on a daily basis watching the escapes through Czechoslovakia all the way through the hammering away of the Berlin Wall. We watched that on a day-by-day basis. Cable in the Classroom also provides, obviously, high quality programs, but as far as the educational community is concerned, it is also commercial free and it maintains the integrity of the classroom. Our community made a strong statement a year or so ago when they had to make a decision as to whether or not they wanted to commercialize the classroom to bring in a service. They voted no on that particular issue. So, it is very important to understand that this is commercial free and we can use it and implement it into our classroom.

Another additional component of the Cable in the Classroom is the fact that there are support materials delivered right into the classroom. I will expound on that a little later as we get into this presentation and let you know how those materials come into the classroom. There are lenient copyright clearances that allow teachers to tape it, use it as we see fit, when we want to use it. It is at our total discretion.

What I am trying to do by using the Cable in the Classroom Project is to build an awareness of a world community as far as my students are concerned. I am also trying to establish and to maintain critical thinking skills, to promote a decisionmaking process, to foster personal development, and to show visually and dramatically that a good education equips my students, to be people of positive action. I believe that these resources coming into the classroom allow me to meet those objectives.

What is available in terms of the Cable in the Classroom Project? Again, it was touched on a little earlier, but I will name a few: We have the A&E Network, Black Entertainment Television, Bravo, C–

SPAN, CNBC, all of these are offering programming. CNN, which I will show you in just a minute and talk to you in greater depth, Court TV, the Discovery Channel, ESPN is involved with a block of educational programming, the Family Channel, the Learning Channel, Mind Extension University, PBS, and the Weather Channel. Maybe during the question and answer section I could develop more about the scope of the programming that is available, because it truly is amazing and has really grown in the last 2 years. All of this comes into the classroom via cable.

Now, the structure that is needed: In my particular school we did not receive a huge grant. We are not a site where we had equipment up until this year donated to the school. What we were able to do, is use the resources that we had in the school already. That is what makes this so powerful, we had the resources in the school. We had a computer, a TV, a VCR, and a cable company, TCI of Montana, who was interested in bringing cable into our school. When they brought that service into our school, we went to work reorganizing some of the equipment that we already had. Therefore we now have the infrastructure to bring these services into the school.

TCI of Montana has wired our school and is in the process, actually, of wiring our complete school this year as they named us a model school this year. We are going to have cable into each one of our classrooms. Up until this year, there were only a couple of cable outlets in our school. I was lucky to have one.

In addition to the cable, they also provide a free cable programming guide. In the packets you have received, it is in the back cover. It is called the Cable in the Classroom. This is a detailed listing, by discipline, what is the programming for the current month. On the inside of it there is a quick pullout calendar that allows teachers to post it on the wall and see the blocks of programming that is available. Again, these are commercial-free blocks. We have programs, CNN Newsroom, which airs every day, A&E Classroom that comes on every day with a different topic, and Assignment Discovery. I can get into that down the road.

TCI offers the schools two X-Press kits. There is a data feed that is fed through cable television lines which feeds into the back of a computer. The teacher's guides, the X-Press lesson plans which are designed by educators, are delivered into the classroom and printed off on the computer. TCI has a program for schools which do not have a satellite dish. The schools can buy one at cost. There is also a purchase program available for the TV and VCR. So, basically, this is what you need to get the program up and running into the classroom.

What I would like to do is to talk to you about one of the services that I use. It is called CNN Newsroom. CNN Newsroom is a program that starts at 1:45. It is taped at 1:45 Mountain Time, 3:45 Eastern Time. At night in my home I have my VCR set, so my schoolday actually begins at 1:45. In the morning, I wake up, I preview the tape. It is a 15-minute commercial free block. I preview the tape, I bring it to school. The first thing I do is flip on the computer and via satellite, teacher's guides that were designed down in Atlanta are delivered into my classroom. So, by 8:45 each morning I have a videotape 15-minute block in one hand. I have a 4-

page teacher's guide that correlates with that 15-minute tape in the other hand, and I am ready to start my lesson. I spend the first 15 minutes of each day covering the topics that are current.

What I would like to do is show you, if you can see the overhead, the scope of some of the programming that my fourth graders were exposed to last year. If it is happening, if it was on CNN, we were there. The immediacy of what is happening—I can remember the San Francisco earthquake, 5:03 in the afternoon. The cable news network working for me in my classroom, if you could look at it that way. By 8:45 the next morning, I had a 15-minute program, complete with interviews from citizens of San Francisco, a report on the San Andreas Fault, what is a seismologist, what does he do? All of this was packed into a 15-minute video delivered into my classroom with teachers guides the next morning. Obviously, stories with the collapse of Eastern Europe, the stories in the Soviet Union, the CIS this year, all of those resources coming into my classroom on a daily basis.

They also provide a section of that 15 minutes which is dedicated to a certain curriculum issue. It could be science desk, where we learn about the latest science achievements. It could be future desk. There are five different desks each day of the week.

These kids are exposed to a lot. I will be ready to answer your questions here as we get more toward the end of this presentation.

I think what I would like to do, at your discretion, is show a 3-minute video. You have a copy of that video. We can take a look at it now. It will show generally, what this looks like in place in the classroom. If you have questions, I can show you some additional programming and also how the computer works bringing guides in and some of the interesting things that are available as far as the classroom is concerned. Would you like to see the video?

Senator INOUYE. Please proceed.

Mr. KUGLIN. OK. You can see something is going right. It was something I could not quite put my finger on. Bringing these resources in and being able to talk to these kids in an upper level of sophistication.

When we got our test results back from the first year, my fourth grade students had tested at a high class average. This was not a special class where they were ability grouped. They tested at the 88th percentile on the CTBS test scores. That translated to a grade equivalent of 9.4. That was in social studies and science. As we move into this as a platform, we tie in our mathematics. We tie in all of the other subjects as we move in with this one particular program. I use other resources in my classroom as well. I have a noticeable increase in test scores.

Senator BURNS. Jason, do you like this kind of a technique?

Mr. SLATER. Yes.

Senator BURNS. You go to school down there.

Mr. SLATER. I like it because instead of just sitting and reading out of a textbook you can watch the TV and see things in motion and how they are around the world.

Senator BURNS. Kayla, you want to comment on this technique?

Ms. BROSIOUS. I think in third grade, I had good grades, but in fourth grade I got a lot better grades because of CNN Newsroom, I think.

Senator BURNS. Thank you very much. I have no more questions. I think—I do not know how you could have any more questions, they pretty well covered the ground. [Laughter.]

You know, how much further do you want to take this? [Laughter.]

But thank you for coming, and thank you, Mr. Chairman. I appreciate that.

Mr. KUGLIN. Thank you.

[The prepared statement of Mr. Kuglin follows:]

PREPARED STATEMENT OF JOHN R. KUGLIN

I offer this testimony regarding the use of telecommunications technologies in education to the Communications Subcommittee of the Committee on Commerce, Science, and Transportation.

I would like to thank the committee for the opportunity to address the monumental changes taking place in education today. As you know, technologies in education are advancing at a staggering pace. Television, as a teaching tool, is leading the new opportunities afforded to educators by this changing technology. I hope to share with the committee the available educational materials delivered directly into the classroom via telecommunications.

PROFESSIONAL BACKGROUND INFORMATION

I would like to start with a brief description of my professional activities. I have been involved in education for the past twenty years. The last fifteen years have been in Missoula School District One. My teaching assignments have ranged from fourth grade through eighth grade, in virtually all disciplines. My current duties are fourth grade teacher and Elementary Computer Lab Coordinator. Computer Education has always been my strongest area of expertise. I have computer teaching experience from kindergarten through adult ages. I conceived the idea of and implemented the first elementary computer lab in Missoula. I have conducted graduate level computer courses through the University of Montana for over three hundred teachers. My class was featured on CNN for its innovative use of technology. I was nominated and selected for the regional Gold Star Award for excellence in teaching. I will be featured this fall in a booklet called "Power Teachings" produced jointly by CNN and USA Today. The concept of the booklet is to profile 10 teachers and how they use technology in their classrooms. I have conducted several workshops around the state on topics ranging from hypermedia to the Cable in the Classroom project. My school was recently nominated and selected to be one of TCI's model schools. I will be busy in the future attending to the needs of this innovative project.

PHILOSOPHY

My philosophy of teaching with technology is to help my students to become better thinkers. I would like them to develop and build a decision making process, based on the solid facts of an issue. I also try to show my students, visually and dramatically, that a good education equips them to be people of positive action and well-rounded individuals. The Cable in the Classroom resources help to build a solid base of information for young people to access in their decision making process. If the topic is smoking, abuse of alcohol, drugs, or the importance of securing an education, my students have seen or read a story in which the consequences of bad decisions have been illustrated. This ability to relate to a real life situation allows my students to compare the story to their own lives. I believe this has a meaningful and relevant impact on their thinking.

I also believe this is the video generation. Children respond to a multi-sensory approach in instruction. Video resources used to introduce a story or concept, coupled with cable delivered print resources like X-PRESS, offer a fresh delivery system that holds the interest of students for a greater time.

Finally, the ability to travel all over the world in a moment's notice has strong educational implications. Placing the world wide resources of the Cable in the Classroom programmers into the classroom, can only increase the productivity of the teacher and students. What fantastic tools, we as educators, have to work with today!

WHAT IS THE CABLE IN THE CLASSROOM PROJECT

Cable in the Classroom is a nonprofit service of the cable television industry. Major cable companies and national cable programmers formed Cable in the Classroom in 1989 and are working with the educational community to address the challenges facing America's schools. The Cable in the Classroom Project provides high quality educational programs and data services through cable television lines in public and private schools throughout the country. Schools are not charged for the cost of programming, and programs are commercial free.

The programs offered cover a wide range of topics and have been selected based on their academic merit. Educators can select programs on: Fine Arts; English; Journalism; Math; Computers; Science; Current Events; History; Geography; Foreign Language; and Business.

Many programs have support materials available that provide useful lesson plans and activities related to the topic. The materials are designed to facilitate critical thinking, class discussion, individual and group activities, and assignments outside of class.

In addition to the cablecast programs, schools with personal computers can utilize the X-PRESS program for access to print materials. These materials contain the latest national and international news, as well as data pertaining to high technology, education and business. X-PRESS helps students find, manage and apply timely information to their everyday lives. X-PRESS also delivers daily programming highlights and teacher support materials.

THE TCI EDUCATION PROJECT

The TCI Education Project is part of The Cable in the Classroom family. It is sponsored by Tele-Communications, Inc., the nation's largest cable operator, and its affiliate companies. TCI is offering the educational programming to schools within the company's service areas.

Although education primarily involves teachers, books and classroom work, there is a supplementary role television can play in many instances. Accordingly, TCI has made a firm corporate commitment to education. In service areas, TCI companies will provide free cable hookups, programming and wiring to a central location for schools that would like to participate in the project Schools also have the opportunity to purchase from their local cable company C-Band dish equipment at manufacturer's cost. In addition, TCI will try to help schools that cannot afford video equipment. Schools in this category should form a business partnership with their local cable system manager.

A school that enrolls in the TCI Educational Project will receive copies of the Cable in the Classroom, a monthly program guide. The school will also receive two X-PRESS X•Change starter kits. These kits provide all the hardware and software needed to have access to the X•Change data feed, programming highlights, and daily support materials.

As mentioned above, the programming guide called Cable in the Classroom is published 11 times each year. it provides a comprehensive listing of all educational programming and scheduling. This programming guide provides teachers and administrators with brief descriptions of various programs, as well as what age groups and educational disciplines they are directed to. Additionally, the guide publishes a copyright restriction code which allows teachers to determine what restrictions, if any, exist for particular educational programs. This guide lets a teacher know if a particular program may be used as part of a long-range lesson plan, a short-term discussion, or as a home assignment only.

TEACHER BENEFITS

The TCI Education Project was designed for flexibility. Teachers can videotape programs for use in individual classrooms or cablecast a program at its scheduled time to a larger group. furthermore, cable programmers offer support materials to accompany many programs, making it easy for educators to integrate the subject matter into a scheduled curriculum. Support materials may include lesson plans, ideas for individual or group activities, a list of related topics, and lists of additional educational resources.

CABLE PROGRAMMING PARTICIPANTS

The Cable in the Classroom organization and The TCI Education Project bring together some of the most respected cable television networks and data programmers. The involvement of these companies creates a choice of educational programs unmatched by any other medium. Some of the participants and their commercial free classroom offerings are:

- A & E Network—A & E Classroom
- Black Entertainment Television—Teen Summit
- Bravo—Culture in the Classroom
- C-SPAN—All Programming plus C-SPAN in the Classroom
- CNBC—Smart Living Series
- CNN—CNN NEWSROOM
- Court TV—in Development
- The Discovery Channel—Assignment Discovery
- ESPN—Expedition Earth including "Earthwinds" balloon flight
- The family Channel—"Zorro" in the Classroom and other series
- The Learning Channel—All programming plus "Teacher TV"
- LIFETIME Television—"Your family Matters" specials
- Mind Extension University—Global Library Project
- The Monitor Channel—Monitor World Classroom
- Nickelodeon—"Eureeka's Castle," "Kids Court"
- PBS—All programming
- The Weather Channel—"The Weather Classroom"
- X-PRESS Information Services—X•Change computer service and The Media Centre
- Fairfax County Schools—Electronic Field Trips

Prior to the hearing, an informational packet will be distributed to the committee members containing overviews of the above educational offerings and other important components of the project.

STORIES OF INTEREST USING THE TCI PROJECT

Each year that we have viewed CNN's Newsroom program, starting in October 1989, a historic happening has taken place. The first year was the fall of Eastern Europe. Events happened so fast that year, that textbooks became immediately obsolete. A local newspaper reporter wanted to do a story on how local schools were keeping up with the monumental changes in Europe. He started his report by investigating how high school teachers were trying to stay abreast of the changes in Europe. They, the high school teachers, used daily newspapers as the only source of information. My class coupled the valuable information contained in the newspapers, with extended video coverage offered by CNN, to follow the breaking history lesson. Textbooks were of no value! Upon visiting my classroom, the reporter was shocked to find such a well-informed group of nine and ten year old students. We became the focus of his article. We had followed all the events in Eastern Europe on a day by day basis. This allowed my students to realize the significance of this historic event.

Last year's class followed the Gulf War on a daily basis. Much thought was given to whether children should be exposed to the war coverage. brought the topic up for discussion in my class. It was decided to take a class vote to see whether we should continue or not. The outcome of the vote was twenty-six to zero in favor of the daily coverage. Once the children became informed, they were like any other concerned citizens—they wanted to know about it! Our class was very moved and touched by the whole event. One child in the class had a parent in the war. following the story on a daily basis gave her comfort by keeping her informed with facts.

This year's group is really wrapped up in the presidential elections. Students meet the candidates on Newsroom. They discuss the issues and predict the outcomes of the primary elections based on facts they have discovered viewing news clips and reading newspapers. As important as the elections are, the story with the greatest impact this year has been a series called "VOICES FROM THE STREETS". This series on the homeless had a profound effect on my children. Coming from a sheltered environment like Missoula, Montana, my students have little experience with this part of American life. Only television could bring information into the classroom that could produce such an impact on its audience.

MEASURED RESULTS

I would like to share some information concerning test results after using Cable in the Classroom programming for one year. The test used to measure the students progress is the Comprehensive Tests of Basic Skills or CTBS. The television program used is called CNN Newsroom. use it daily in my classroom. The subjects which benefit most by watching Newsroom in my class are science and social studies. These are the areas I wish to target for comparison. The chart below shows national percentiles, and best illustrates the benefits of using CNN Newsroom in the educational setting.

	District average	District range (by school)	Without Newsroom, Cold Springs average; grade 4	With Newsroom, my class; grade 4
Science	74	(56–81)	76	88
Social studies	75	(55–83)	79	88

ACTIVITIES

The News Game

Every two weeks we play a Jeopardy style game covering material from Cable in the Classroom broadcasts, USA Today articles, and our curriculum. A question bank is established by requiring the students to write five to ten questions, with answers, based on material they have discovered through their use of educational programming. Teachers can also include questions from other classroom curricular areas.

After the completion of the question bank, the game begins. I divide the class into three equal ability teams. A simple box was constructed with three lights on the top. One member from each team holds a button device connected to the boa This setup allows me to see which player has the answer first. With this in place, I start to ask questions from the established question bank. The first person with the answer gets a point for their team. Players rotate after their question. If I stump the three current contestants, I yell the word "CAUCUS" and all team members can participate in answering the question. Remember, I always pick the team with the first light! If I stump the whole class—I EARN A POINT! Needless to say, most games I have a score of "0"! The winning team receives a free homework slip for each player. After these games, the retention level of the material covered in the programming becomes very apparent. Other people who have seen these games in progress can't believe the results. The game is great fun and exciting to say the least!

Newspaper Project

The last quarter in fourth grade is reserved for my newspaper project. This culminates a year long study of both print and video media. Using Cable in the Classroom programming as a springboard for interesting stories, students select topics of interest to them for further research. Print resources such as local newspapers, USA Today, and X-Press information Services are used to research additional information on their selected topics. After the needed data is collected, the writing process begins. We use our computer lab and a program called The Children's Writing and Publishing Center to publish our work. The results are impressive. We try to do at least two papers by the end of fourth grade.

Beginning next year, my students will research stories in USA Today for print information, and incorporate video taken from CNN's Newsroom to support their story. A new technology, introduced a few months ago for Macintosh computers called QuickTime, allows students to create a QuickTime movie clip and place it directly into their document. With a click of a button, the graphic transforms into a full motion video complete with sound as it was seen on Newsroom. Can you imagine Brian Todd and Cassandra Henderson coming alive inside your electronic newspaper with USA Today serving as a data base for text in the story!

Bulletin Board ideas

Objective: To show how news events have a correlation with time and geography. To create a resource center for news game questions and a data base to study story backgrounds.

Procedure: I use a world and a United States map. I post these maps on a bulletin board and display the past story headlines viewed on Newsroom. A student cuts the story description from the guides or clips it from USA Today headlines, and attaches it to the sides of a map. Then, we attach a string to the headline and stretch it to the story location on the map. This connects the story description to the appropriate map location. Over time, students can draw interesting conclusions as to the time and location of the stories they watch! This bulletin board data base is useful in helping students formulate good questions for the news game.

A variation of the bulletin board idea is to create a timeline of important stories. Cut the names of the months off a calendar and post them on the top portion of the bulletin board. As you view or read stories, cut the story description or headline from the newspaper that corresponds with the story and post it below the appropriate month. Over a period of time, students can view a timeline of news events stretching for months if you like. In my room, the time line stretches for two years.

In closing, I hope I've increased your understanding of telecommunications in America's classrooms. As you can see, a whole industry stands ready to help educate our children. When I have the resources of the Cable News Network, The Discovery Channel, or any of the Cable in the Classroom programmers working with me to enhance my lesson plans, fantastic new learning opportunities are created. These unprecedented opportunities can and will change the way we educate our children forever.

Senator INOUYE. Free commercials.

I thank you very much, Mr. Kuglin, it has been most helpful.

May I now call on Ms. Abernathy?

STATEMENT OF KAY ABERNATHY, TEACHER, BEAUMONT INDEPENDENT SCHOOL BOARDS ASSOCIATION, BEAUMONT, TX

Ms. ABERNATHY. Thank you, sir. I appreciate the opportunity to be here today. Before I begin what I have prepared, I would like to say that this Missouri brochure arrived in my mail last week, and that schools in Beaumont, we have wiring from TCI Cable Television, usually in the libraries, and that we have teachers using X-PRESS and X-CHANGE and CNN Newsroom, producing their own news reports. And we agree and are happy to see that our friends in Montana also are using it.

In Beaumont, I am the instructional technology specialist. And that happens to be a new position that was created last year after I had 26 years in the classroom in business and office ed. We have, directly, access to the Texas Education Network in Texas, which you may know is a State initiative that is about to be 1 year old in August. The telecommunications technology I will share with you today centers around the telephone in the classroom. It is probably the most powerful communication technology developed. It connects our students to the community and the community to our students.

The telephone, a computer, a modem, and telecommunications software are technologies which form the basis for our teachers electronically excited and sharing, with an acronym of Texas, Crista McAuliffe project which was initiated this year. It is a multidistrict project, and last summer, working with the Crista McAuliffe group at Stanford University, sponsored by the National Foundation for the Improvement of Education, we initiated—Texas teachers initiated this conference. It is a thematic curriculum integration approach.

Our theme this year was economic development. We had 63 teachers across the State of Texas using our new network who volunteered for the project. They taught students in grades 2 through 12. They taught many, many curriculum areas—30 of the teachers were in the Beaumont District. Classrooms were paired with others across the State, giving students and teachers the opportunity to respond to each other. Some of us were as far as 800 miles away, from El Paso to Beaumont, where the El Paso students had to get maps to find where Beaumont was located; from Dumas in the Panhandle, to our southeast Texas corner.

Students and teachers used a personal economic awareness survey to help begin class discussions. Questions for experts were generated and public officials and business executives were recruited to answer those questions. Their answers were put on the network, and all students across the State could read them. Students decided which businesses and organizations in their local communities they would like to study, and then the conducted a fully developed investigation into the economic impact that company or organization had in the community. The telephone facilitated this learning.

A group essay was written, it was uploaded to the network, and shared with other schools for discussion and reaction. Participants were asked to telepublish their essays and share those publications with community economic development organizations. The Texas Education Network has given the Texas teachers and their students the opportunity to become part of a whole, taking them away from the isolation of the classroom of the past. Teachers and students are now beginning to see themselves connected to the world, and they are beginning to see how their actions have potential for creating their future.

Without a doubt, the highlight of the project has been the extension of the online telecomputing to a community development project we call the Texas Crista McAuliffe Economic Summit. I have a notebook of pictures of students participating in that conference. We had the conference on the Lamar University campus in Beaumont on April 28. Area businesses conducted breakout sessions for students explaining economic development, the global economy, and how it affects us all. We had public officials, our State Representative Mark Stiles, Jefferson County Judge Richard LeBlanc, Beaumont City Councilman David Moore, Beaumont Independent School District Superintendent Dr. Joe Austin, served on panels and answered students questions, as students had opportunity to make connections with their communities. Senator Phil Gramm sent answers to student-generated questions by facsimile from Washington on the day of the summit, actually happening real time as the students were involved.

Three student teams videoed the entire conference. One was a fifth grade team from Homer Drive Elementary, one was an eighth-grade team from Marshall Middle School in Beaumont, and a third team was a high school from Hardin Jefferson High School in nearby Sour lake.

Most districts are using existing computers, software distributed by the State, modems, and telephone lines. Most districts have not yet added a great number of telephone lines. The Beaumont District added 7 new lines, and then extensions from existing lines on 13 of our 30 campuses this past year. In all, 30 classrooms in our district have telephone lines for instructional use.

In Texas we have the statewide network which was developed through strategic planning, where many community members, including business people and teachers were surveyed about their needs for communications. We built what people wanted. In our model for the Nation, 40 master trainers were trained last August, and several statewide followup training sessions have followed. These 40 trainers train teachers and administrators in regional service centers, and those teachers and administrators train people in their local districts.

The Texas Education Network is a distributed computer system which provides local access in 15 major metropolitan centers of the State and toll-free lines to educators located outside the local calling areas. The Texas Education Agency provides online time for public school users. Network nodes are named after classroom teachers who have worked with telecommunications.

We have developed a new community of learners and users, from resources such as the Michigan underground weather information, NASA's SpaceLink, Cleveland Free Net, and university libraries available to us through the Internet, to conference areas for the Texas parks and wildlife, for administrator and teacher professional organizations, for the United Press International News feeds, CNN Newsroom lesson information is also available there. Our users are seeking information from these new sources, and are using that information to make better decisions.

Access to the Internet, the ability to download files from NASA archives, and the future availability of ERIC, give Texas students and teachers a window to the world. Texas teachers are making connections through the Internet, with the National Science Foundation projects and the Technical Education Resource Center projects.

We believe we need a full range of technologies. A satellite in the sky is good, and we like those, but they are not our only choices. We feel the Department of Education is not compliant with that to which the Texas teachers and their teacher friends from Louisiana, from Indiana, from Hawaii, from Alaska, from Washington, from Oregon, and from California, Kentucky, Maryland, and New York, have access. I named these States because I worked with teachers from those States last summer in the Crista McAuliffe Project. We cannot connect without a national network. We know that we have that coming; we can connect to our network in Texas, and that has helped us. We need a national initiative so that we can have connections to the Federal Government and its resources, as well as to each other.

We want to see the Department of Education take a major compatible role in providing information to all schools, to promote the use of telecommunication technologies for educational purposes; we need public and private administrative leadership and support so that our States will invest in these technologies. Our district and local campus-level administrators must be encouraged to take a strong leadership role in telecomputing technologies, including the classroom telephone. Give us support for what we know excites our teachers and our students about learning and teaching electronic networks. Help our teachers get access to classroom telephones. Help us negotiate with the FCC and the State public utility commissions, so that telecomputing will be realistic and attractive for school administrators and local school boards.

Because telecommunications helps teachers and students solve problems, achieve beyond expectations, because it helps students and teachers to think critically, to question, and to evaluate information, help us get our State and local organizations the support that they need.

Thank you very much.

Senator INOUYE. Thank you very much, Ms. Abernathy.

I will have to leave right now because we have a vote pending and I believe we have about 3 minutes left. So, we will stand in recess for 10 minutes.

[A brief recess was taken.]

Senator INOUYE. Ms. Abernathy, your economic summit is most intriguing. You indicated that teachers and students were involved. What grade level was this?

Ms. ABERNATHY. Grades 2 through 12.

Senator INOUYE. Grade 2 to 12?

Ms. ABERNATHY. Two through 12. And it was a concern for teachers in the beginning. We asked teachers to volunteer if they would like to help plan this activity for the students who had been on the network, been involved in the project on the network. And they were very concerned that the age difference might be a problem. We divided—we had two different panels, one for grades 2 through 6 and then one for grades 7 through 12. But all of the students came prepared with questions, they went to a microphone and stated their name, their school, and asked their question.

Some of the questions involved the environment and what impact the pollution from the refineries had on the economic development of our area, some questions involved technology and what technology will be needed for the future. These public officials were most accommodating and most impressed, and they very favorably worked with us that day in answering those questions.

Most people thought it would not work with that range, but we had evaluations online that day. Some teachers went back to school and their students wrote evaluations and posted them on the network. They wrote about how much the younger children knew, and the older ones hoped that they will get to introduce important people next year. We had the second graders introduce the president of Lamar University. Students ran the complete conference. Not one teacher said one word during the entire conference. Students did everything.

This year, we plan to bring student groups in to plan the conference itself.

Senator INOUYE. I think we should have the Congress wired for this, because we have great difficulty understanding economic development, as you know. [Laughter.]

What do second graders do in a program like this? I am just curious, that is all. Do they understand the economy?

Ms. ABERNATHY. Well, we talked to them about the communities and how we are all dependent upon one another, the teachers talked to them about how important it is for schools to understand what businesses do. We had people who answered—for instance, the director of training at Gulf States Utilities answered their questions about what Gulf States contributes to our economy. They asked what it means for gulf States to be in Beaumont, TX, how many jobs they provide, what kind of training they provide, what kind of services they provide, and students became aware of that.

We had American Valve and Hydrant Co. They make fire hydrants. He actually brought some of their products and the students were there to inspect them, and they learned about other companies as well.

Southwestern Bell talked about fiber optics, and we thought this is going to be way over those little one's heads. Those kids were just fascinated. They had demonstrations for them and they were very receptive.

Senator INOUYE. Thank you very much.

Senator Burns.

Senator BURNS. I want to hear Mr. Sakamoto.

Senator INOUYE. Thank you very much.

Dr. Sakamoto.

STATEMENT OF CLYDE SAKAMOTO, PROVOST, MAUI COMMUNITY COLLEGE, KAHULUI, HI

Dr. SAKAMOTO. Thank you, Mr. Chairman, distinguished member of the committee. Aloha.

I am provost of Maui Community College, just a little bit further than Missoula, MT. We are one of seven community colleges as part of the University of Hawaii system. I thank you for the opportunity to review distance learning developments in a rural community in Hawaii and to testify in behalf of continued and expanded support of technological applications to improving learning in rural communities.

Within our tri-isle county of Maui our college serves 2,600 credit students and over 8,000 noncredit students in any given year. We are the only postsecondary institution in the county. And like MCC, other community colleges in rural areas increasingly contribute to a network of distance-learning institutions. An instructional telecommunications survey that was published in 1992 indicated that some 600 community colleges either have or are currently planning distance-learning programs. This gives you an idea of the scope of 2-year college involvement in the distance-learning landscape.

Since 1983, distance-education technology and programs have linked our tri-isle students to expanded postsecondary opportunities. Some of our capabilities at the college include a cable channel 12. It is a countywide cable television channel established in 1983 in partnership with our local cable franchise, and through title 3 funds, and it is currently programmed full-time by Maui Community College.

We also have a program called "Skybridge." It is a tri-isle interactive television system that connects Maui to Molokai and Lanai, as well as to the remote community of Hana. This was helped to be established by the NTIA funds, along with private sector support, county support, and State support, as well. And so indeed there are partnerships that are occurring that do involve the private sector in a very constructive fashion.

We are also connected with the Hawaii Instructional Television System. It is called HITS. It is an ITFS system that connects six of our islands in the State of Hawaii.

The college also enjoys a 10-meter satellite dish that allows us downlink capability, and this dish permits MCC and other University of Hawaii institutions linked to our college to participate in national teleconferences telecast over any satellite passing over the Pacific.

MCC also supports a computer and fax network, and this permits our students and faculty to interact over electronic mail, through faxes back and forth, between and among the different islands.

Finally, we are also hopeful of being connected to the Maui high performance computing center that will be hopefully established within the next 18 months. Access to massively parallel computing capability through a high-speed data communication system will allow us to create optical images with which elementary, high school, college students might begin to actually perceive concepts, visualize concepts, that were formerly only theories. And so we are very anxious for this particular development.

In our latest spring 1992 semester, 538 students were enrolled in 43 courses available on 3 different islands through our television instructional programs. In addition to our community college courses televised over our cable system and those interactive courses sent over the college's Skybridge system, the Statewide HITS program offered upper division as well as graduate division programs.

One of our proudest examples of distance learning is our cooperation with our department of education and our State high schools through an advance placement calculus course. This AP calculus course is currently offered to over 60 students in 12 different high schools in Maui County and around the State, and offers a chance for students around Hawaii to access higher math from arguably the best math teacher in the State. The course is telecast via our cable educational access channel on all six islands. A phone bridge system from the participating classrooms around the State allows students to ask questions during the televised class. Fax machines and two 800 telephone numbers into the teachers home, one incoming and one outgoing, also facilitate student and teacher interaction.

The telecommunications possibilities for higher education are exciting and have already begun to demonstrate their potential. In concert with interactive television systems and computer networks, an integrated, communitywide, distance education system can provide different models of education for rural communities.

As a matter of national interest, the human resources of rural communities and under-represented minorities in higher education are assets that have been underutilized and underdeveloped. Through telecommunications technologies that may greatly improve rural access to education and information and the related opportunities for individual and community development, significant resource development gains are being achieved. As these technologies allow access to expertise, knowledge, threshold information, and new competencies, as well as to higher education credentials, I strongly urge that funding to strengthen an expanding network of distance learning capabilities be continued.

To further proliferate and support such access, I would further recommend that incentive programs that encourage and reward private sector telecommunications applications and contributions to education be explored. And to accelerate the development of these technologies for rural applications, I would recommend demonstration projects incorporating and balancing technological support with faculty development and student interaction components be stimulated.

Finally, I wish to thank the chairman for his vision and continuing encouragement of our efforts on Maui to bring threshold learning opportunities to our islands and other remote communities around the country.

Thank you.

Senator INOUYE. Thank you very much. In order that my colleague will understand what we are dealing with, the Island of Lanai has approximately 3,000 residents. The Island of Molokai has about 6,000 residents. So, when we speak of a rural community, it does not get any more rural than that. The Island of Lanai has one harbor which receives a barge once a week, and a short runway. Molokai has one little harbor and a longer runway. And so this type of educational system is important if we are to open their windows to the world.

I wish to commend Dr. Sakamoto for the role he has played in bringing this about.

Do you have any questions?

Senator BURNS. No, Mr. Chairman, just an observation. And I would agree with Dr. Sakamoto that your representative in this body has great vision. And it has been most rewarding to me to work with him ever since I came to this body in 1989.

I would also make this observation that Dr. Ravitch should have stayed and heard this panel. We tend to flop these things around, and I think this panel has been unusually exemplary in my estimation. There is a myriad of ideas and people with great imaginations and innovations—very innovative—who teach our kids, and that is what I was telling her, that it does not take a rocket scientist and a department—it does not take dollars. It just takes somebody with a little bit of vision to say OK, we need to create in this department from the personnel that we have to bring—to pull this together and to coordinate some of the things that are happening in education.

I think we are behind the curve. Of course, Government is noted for that. But we are trying to catch up. And I think with your testimony here this morning we will catch up. But they will not catch up willingly. They will come dragging and kicking and scratching and we will finally get it done.

Dr. Ward, I appreciate Ms. Abernathy's points very much, some of the things that are happening there, and when we trip the minds of these young people, if you would just trip that curiosity, everything else kind of falls into place and they are very bright.

So, I congratulate each and every one of you on your vision and what you have done locally, because that is where it has got to happen.

So, I thank the chairman for allowing me that opportunity for those observations.

Senator INOUYE. Thank you.

I have a question for anyone on the panel. In your presentation you have said much about the classroom, about the members of the faculty and the students. There is an effort throughout this Nation to involve parents to a greater degree. Do we have programs in which we target parents?

Mr. KUGLIN. Maybe I could address that one. In our school district we levied a special one-half mill that allows for adult education. We have many programs instituted within our school district that promote parental activities. I, myself, open up the computer lab Wednesday nights from 6:30 to 8:30 so that grandpa and grandma or mom and dad can come down with the kids and have the kids show them how to run the computers. There are many other programs available which adults are participating in. They are very instrumental with site-based management where the parents can come in and form committees and help to make the decisions necessary for the education of their children.

Senator INOUYE. Dr. Ward.

Dr. WARD. Yes. I think your question verifies the need to have various technologies integrated together in order to deliver educational programming. If you simply take the satellite approach to distance learning, for example, and if you start talking about parent education and education in the home, obviously, you are somewhat limited by equipment—the downlink dish. Integrating cable and satellite technologies will serve our education purposes in this country much better so that we can deliver a certain amount of parenting education, not to the school house but to the home.

There are some efforts underway in Missouri, to have the "Parents as Teachers" program which has received international acclaim, delivered directly to the homes. And there are discussions underway right now to where we can hopefully start delivering more training in terms of early childhood education, training and parenting education via technology into the homes, not just in Missouri, but again, nationally.

Senator INOUYE. Ms. Abernathy.

Ms. ABERNATHY. I know of State innovative grants that were give a couple of years ago and they continue to be given. One of several project, in fact, involved take home computers for students with the modems if parents came to be trained, and so they were checked out for a month at a time. This was down in the Rio Grande Valley, in Senator Bentsen's part of the country. Parents came to school to be trained and they were able to take the computers home with them and use them in the home to communicate back with teachers. I know that that happened down in the Rio Grande Valley. I think there are probably several other projects like that going on.

We had parents involved in our summit. As we called upon parents to be some of those experts, we called on parents to serve there that day as host and hostesses.

Senator INOUYE. Thank you. Dr. Sakamoto.

Dr. SAKAMOTO. We have an agenda that we have been working on with our Maui District Office of Education that includes the possibility for a program that would be aired on cable that would permit parents to serve as coaches for their young children in terms of the whole learning process. This is something that is in its very formative stages, but we are very interested in the support, coach, and help role that parents must play in order for students to succeed.

We do know on Maui and elsewhere in the State and in the country that without parents as partners we will not make the kind of progress that we need to make in improving higher education—higher education, lower education—around the country. And so we are very interested in this development.

Senator INOUYE. I thank you. In my opening remarks I indicated the sad statistics of this Nation on illiteracy and such. After listening to this panel, my hopes are high.

Thank you all very much.

Our last panel consists of the following: Ms. Shelly Weinstein, representing NETO/EDSAT of Washington; Dr. Mabel Phifer, president of the Black College Satellite Network; Ms. Celia Ayala, director of curriculum programs and instructional technologies division of the Los Angeles County Office of Education; and Mr. Pat Wright, director of TCI Educational Services of Englewood, CO.

Senator INOUYE. May I begin by calling Ms. Ayala?

STATEMENT OF CELIA AYALA, DIRECTOR, CURRICULUM PROGRAMS AND INSTRUCTIONAL TECHNOLOGIES DIVISION, LOS ANGELES COUNTY OFFICE OF EDUCATION

Ms. AYALA. Thank you very much, Mr. Inouye and members of the Communications Subcommittee. I work for the Los Angeles County Office of Education, which is in California.

You do have a packet of material that was submitted to you with some backup information that I believe would give you some additional insight into what we began about 5 years ago in the area of telecommunications.

Today I would like to address all of you in terms of technologies, plural.

The technology infrastructure necessary to facilitate education reform, to remove traditional educational barriers, and to provide students with needed skills and competencies.

The interconnecting of the several technologies are driven by the characteristics of schools for the next century.

That is to say, one, the pace of the complexity of change placing enormous demands on educators at all levels to access, interpret, communicate all of information more rapidly. Two, the increased difficulty in making timely decisions and developing quality programs because of the proliferation of information about students, about resources and about curriculum.

Three, a shared decisionmaking environment in which instant access to information by teachers, principals, central office staff and students is demanded. And four, increasing pressures to focus the organization and respond to demands for accountability and communication by various stake holders in the education community.

The Los Angeles County Office of Education is a technical assistance unit legislated by California law to serve 95 school districts covering 4,083 square miles with some 67,800 teachers and administrators and 1.4 million students. We are rural in some areas. We have a district with 68 learners in a mountain area, as well as urban, with Los Angeles Unified school district composed of 625,000 students.

So, in L.A. County, we do have a geographic isolation, as well as the urban gridlock. Nevertheless, the Los Angeles County Office of Education is mandated to be a leading regional educational agency providing programs and services to prepare an educated citizenry for the 21st century.

The division that I work with, curriculum programs and instructional technologies, as part of our 5-year strategic plan, has a mandate. And the mandate is that we would use technologies, voice, data, and image, to develop and deliver educational information, curriculum, and instruction, staff development to every classroom in the region, the region being all of the southern California area.

In 1988, we reallocated already existing resources and invested in a satellite uplink as one way to perform our job, to provide equity by providing access to the best and the latest relative to reform and curriculum instruction and assessment and to help teachers be better teachers and to help leaders be better leaders.

We went up, live and interactive, 22,000 miles in the sky and we came down wherever the districts were able to spend $5,100 for an Earth station or a downlink. As well as working with local cable operators to carry the signal to either the schools, the homes and the communities at large, as well as working with areas that had ITFS capability to reach schools and to negotiate with local PBS stations for carriage to tape off air and even bicycle the tapes wherever all of the other interconnection was not available.

ETN, the Educational Telecommunications Network, is a one-way video, two-way audio KU Band technology. We do have an FCC license and we do have a national footprint. ETN is accessible on an ongoing, organized basis to some 91,000 teachers and administrators in the State of California and has the potential of some 219,000 teachers and administrators just in California alone.

In 1989, validating the importance of parents to a child's learning, ETN established The Parent Channel. Because Los Angeles is 36 percent white, 36 percent Hispanic, the programs were offered both in English and Spanish. With the help of PTA—chapter 1 parents and migrant parents, the Los Angeles County Office of Education Center for Parent Education. We trained parents to become "satellite" facilitators to receive the live programs—or to tape and use offair later—to be able to use the activities suggested and support materials and otherwise engage parents in skill building and in understanding schooling issues.

Today, ETN is engaging the more than 1 million members of California PTA on an ongoing partnership and has the potential and a strategic plan to engage the almost 7 million national PTA members at least.

In 1990, the office undertook direct instruction to youth. We were fortunate to receive a Star Schools project to be able to implement mathematics and science instruction to fourth, fifth and sixth graders. This is TEAMS, which is Telecommunication Education for the Advances of Math and Science.

One of our stellar programs in the office on ETN, just like Star Trek, TEAMS ventured to places where no one had gone. Heretofore, almost all distance learning was geared to advanced placement and other secondary curriculum. It was our belief that we could use technology to stimulate, motivate, and retain boys and girls in the areas of mathematics and science. We have, we do, and we will.

The studio teacher, with his or her colleague in Boston, Detroit, Washington, DC, Arizona, Utah, and Missouri and all over the State of California coteach mathematics and science based on national standards, and model successful strategies in a live interactive format.

Chapter 1 children, which have been some of the most underserved both in rural and urban areas, are provided with an accelerated rather than a remedial curriculum, and they are able to participate in a live interactive mode, reinforcing what they have learned from the studio teacher as well as on their own.

These partners of ours have purchased downlinks, negotiated with their cable providers, with local PBS stations or use their own ITFS capability to transport the programs on the ground as well as use other technologies as fax machines, TEAMSNET, which is part of Internet. We also use the laser disc and other video technology.

In the next school year, TEAMS will be serving approximately 50,000 children across the country at 600 sites in Boston, Detroit, Arizona, Missouri, Utah, Canada, California, and anyplace else where the technology is available.

In October 1992, we will inaugurate what we are calling our Adult Learning Channel. We will be providing training for ESL—English as a second language—teachers, literacy tutors, and for offering direct instruction in school to work transitional ESL and vocational ESL training. We will have satellite seminars for school board members who must make policies for mathematics and science, for doctoral candidates, professors, and others who will not otherwise be able to meet on a face-to-face basis.

But even though all of this will go up via satellite, the benefits to be derived as it comes down, we need your help. Everything is dependent upon ground carriage, whether by cable, by television, over-the-air television such as PBS, and now at some time via telephone. The Los Angeles County Office of Education and ETN are also exploring compressed video, because we want to depress the cost on the ground and we are given to understand downlinks will be cheaper, but we will continue to use our existing resources.

What can you do to help us? One, to broaden the opportunities for the education community to acquire telecommunications technologies. One area is to go beyond the existing "seed money" in Star Schools projects in order to continue the demonstration and model programs to a 3- to 5-year period to allow the opportunity for institutionalization of a program before replicating it elsewhere.

Two, in terms of going beyond the Department of Education for fiscal resources, such as the Department of Commerce, Department of Defense, and the Bureau of Indian Affairs, as well as the Department of Agriculture and NSF.

Another is to look at expanding the area of distance learning and telecommunications to the elementary level and to continue to include the parents as primary partners in the education of their children.

Two, to loosen the funding regulations in order to allow for the acquisition of telecommunications and other technology equipment. Currently only OERI as part of our Star Schools project and some of the NTIA grants allow for the purchase of capital equipment. We need to look at other existing legislation such as chapter 1, Head Start, title VII, to allow these children to also be able to access the technologies that we all need to function in the 21st century.

Third, we ask your help in enforcing regulations for cable operators relative to wiring schools and providing local educational access. Many access opportunities have been lost to new cable offerings. They were seized up by the argument that we were not using them. The Cable in the Classroom Project has not taken a proactive policy stance relative to local educational access; rather, it is fostering existing national cable programs offering up as having educational value. We believe we as the educational community have a better knowledge of what our children, our parents and our teachers need.

And last, to stabilize the transponder rates for education. As we look at compression, we are hopeful of receiving some economic benefit when buying transponder time. However, there is discussion in the industry that if we go compressed, rates will be raised to accommodate their perceived loss of income.

Also, with the FCC permission for phone firms to carry television programming, close monitoring of the rate structure changes or pass-along costs for developing the video dial tone will need to be part of the game.

At a time of fiscal crisis in education, technology is not a luxury. It is a necessity, in order for students to learn what they need to and in order for teachers to teach in a better way.

I would like to thank the panel on behalf of the L.A. County Office of Education, ETN, and TEAMS and others for the opportunity to tell you about what we have done in the last 4 years. Thank you very much.

[The prepared statement of Ms. Ayala follows:]

PREPARED STATEMENT OF CELIA C. AYALA

Chairperson Inouye and members of the Communications Subcommittee, I am Celia C. Ayala, Director of the Curriculum Programs and Instructional Technologies Division in the Los Angeles County Office of Education.

Today, I speak to technologies—the technology infrastructure necessary to facilitate education reform, to remove traditional educational barriers and to provide students with needed skills and competencies.

The interconnecting of the several technologies are driven by the characteristics of schools for the next century, that is to say,

- the pace of complexity of change placing enormous demands on educators at all levels to access, interpret, communicate information more rapidly.
- the increased difficulty in making timely decisions and developing quality program because of the proliferation of information about students about resources, and about curriculum.
- a shared decision making environment in which instant access to information by teachers, principals, central office staff and students is demanded.
- increasing pressures to focus the organization and respond to demands for accountability and communication by various stake holders in the education community.

The Los Angeles County Office of Education is a technical assistance unit legislated by California law to serve 95 school districts covering 4,083 square miles with some 67,800 teachers and Administrators and 1,407,000 learners. We are rural—Gorman with 68 learners—and we are urban—LAUSD with 625,000 learners. So, in Los Angeles County we have geographic isolation and we have gridlock. Nevertheless, the Los Angeles County Office of Education is mandated to be "a leading regional educational agency providing leadership, programs- and services to prepare an educated citizenry for the 21st century." In my division our Bold Vision reads, "We will use technologies (voice, data, image) to develop and deliver: Educational information, curriculum and instruction, staff development to every classroom in the region."

In 1988, we invested in a satellite uplink as one way to perform our jobs; to provide equity by providing access to the best and the latest relative to reform in curriculum, instruction and assessment; and to help teachers teach-better and to help leaders lead-better.

We went up live and interactive * * * and we came down wherever districts spent $5100 for an earth station * * * and/or worked with their cable operators to carry the signal to schools and homes * * * and/or developed other creative distribution systems from using their own ITFS capability to reach schools to negotiating with the local PBS station for carriage to "taping off-air" and bicycling tapes—the least attractive, but necessary if there is no interconnection.

ETN is one-way video, two-way audio, a Ku-Band technology; has an FCC license; and lays down a national footprint. ETN is accessible on an on-going, organized basis to some 91,000 teachers and administrators in California alone; and has the potential to impact some 219,000—teachers and administrators—in California alone. If they know where we are and have the technology to access us.

In 1989, validating the importance of parents to a child's learning, ETN established The Parent Channel. Because Los Angeles is 36.1 percent white and 35.7 percent Hispanic, the programs were offered in English and in Spanish. With the help of PTA and the Los Angeles County Office of Education Center for Parent Education, ETN trained parent "satellite" facilitators to receive the live programs (or to tape for later use); to use the activities suggested in support materials and otherwise engage parents in skill building and in understanding schooling issues.

Today, ETN is engaging the more than one million members of the California PTA in an on-going partnership and has the potential—and plan—to engage the almost 7 million National PTA members * * * at least

In 1990, the Office undertook direct instruction to youth. We were the recipients of a Star Schools grant for teaching mathematics and science to 4th, 5th and 6th graders. This is TEAMS, one of the stellar programs for the Office on ETN. Just like Star Trek, TEAMS ventured to go where none had gone before. Heretofore, almost all distance learning was geared to advanced placement and other secondary curriculum. it was our belief we could use technology to stimulate, motivate, and retain boys and girls in mathematics and science—we have; we do; and we will. The studio teacher with his or her colleagues in Boston, in Detroit, in Washington D.C., in Arizona, in Utah, in Missouri and all over the State of California co-teach mathematics and science based on national standards, and model successful strategies in a live and interactive format Chapter One children from impacted urban Boston hear and see their counterparts in impacted urban California or in rural Arizona arrive at the same answer from different perspectives—reinforcing that differences are important and there is equal opportunity for all. These partners of ours have purchased downlinks, negotiated with their cable operator or local PBS station or used their own ITFS capability to transport the program on the ground.

In 1992-93, TEAMS will serve 50,000 children at 600 sites in Boston, Detroit, Washington D.C., Mizona, Missouri, Utah, Canada, California * * * and any place else that has the technology.

In October 1992, ETN will inaugurate The Adult Learning Channel for training ESL teachers, literacy tutors and for offering direct instruction in school-to-work transitional ESL and Vocational ESL. We will have satellite seminars for school board members who must make policies for mathematics and science, for doctoral candidates, professors and others who could not otherwise meet Paulo Friere and more * * * But * * *

But even though all of this wall be—it will go up via satellite—the benefits to be derived as it comes down need your help. Everything is dependent upon ground carriage—whether by cable television, over-the-air television such as PBS, and now at some time, telephones. Also, Los Angeles County of Education and ETN are exploring compression * * * because we want to depress the cost on the ground and we are given to understand downlinks will be cheaper; but we need to continue to use existing systems.

WHAT CAN YOU DO TO HELP

1. Broaden opportunities for the education community to acquire telecommunications technologies. Star Schools received an appropriation of some 18 million dollars for K-12 curriculum and instruction advances. CPB/PBS received some 127 million. For several years, those of us in education who went to NTIA for funding support met with blank stares because the emphasis was on establishing or upgrading public television and radio.

2. Loosen funding regulations re equipment acquisition. Many grant awards limit the recipient to renting equipment. Buying telecommunications technologies is not allowed unless it is part of a resources opportunity from the Office of Technology/OERI or NTIA.

3. Enforce regulations for cable operators relative to wiring schools and providing local education access. Many access opportunities have been lost to new cable offerings. They were seized with the argument they were not being used. The "Cable in the Classroom" project has not taken a proactive policy stance relative to local education access; rather it has fostered existing national cable programs offered up as having educational value.

4. Stabilize transporter rates for educators. As we look at compression we are hopeful of receiving some economic benefit when buying transponder time. There is discussion in the industry that if we go compressed, rates will be raised to accommodate their perceived loss of income. Also, with the FCC permission for phone firms to carry T.V. programming, close monitoring of rate structure changes, or pass-along-costs for developing the video dial tone will be necessary to keep us in the game.

I want to thank you on behalf of the Los Angeles County Office of Education, ETN and TEAMS and others for the opportunity to tell you about us. And to thank you for understanding how important telecommunications technologies have become to a future where each student is offered the best possible educational experience in preparation for the 21st century.

Thank you.

["From There to There With K-12 Distance Learning," by Patricia H. Cabrera and Celia C. Ayala; "ETN Statistics"; "TEAMS Executive Summary"; "TEAMS Data"; and "TEAMS Science—Questionnaire Responses" may be found in the committee files.]

Senator INOUYE. Thank you very much, Ms. Ayala. Your State has 36 percent Hispanics, 36 percent Caucasians. Is that correct?

Ms. AYALA. In Los Angeles County.

Senator INOUYE. In Los Angeles County?

Ms. AYALA. Yes.

Senator INOUYE. And you have a large concentration of African-Americans.

Ms. AYALA. Yes, we do.

Senator INOUYE. Native Americans?

Ms. AYALA. Native Americans.

Senator INOUYE. I believe California has the largest concentration of Asian-Americans of any State. Are your programs culturally and ethnically sensitive?

Ms. AYALA. Yes, we are.

Senator INOUYE. Besides the use of language?

Ms. AYALA. We began looking at the Spanish language in order of our largest population, but as well as being culturally sensitive and as well as representing our cultures in our programs, whether they be the Spanish programs or the English programs, we are also looking at the dubbing into the other languages that make up the highest percentage of languages of our student population.

Senator INOUYE. You are satisfied that you are achieving this goal?

Ms. AYALA. We are working at it. It is something that—it is an ever changing demographic trend and we are working at meeting that goal as best as we can.

Senator INOUYE. You are seeking Federal assistance. How much does the State and county provide in your program?

Ms. AYALA. Our current budget is in the neighborhood of $7 million for all of our telecommunications. And the county, out of our general fund, has approximately $3.5 million. We also receive about $3.5 million to provide the math and science instruction on a national level.

And we also get about another $800,000 to $1 million from State department local government, where they are asking us to do health issues, 50-minute segments of where there is no doctor or health and welfare issues, such as AIDS prevention, gang prevention. So, we also get income from other local entities.

Senator INOUYE. Thank you very much, Ms. Ayala. Senator Burns.

[No response.]

Senator INOUYE. May I now call on Ms. Weinstein?

STATEMENT OF SHELLY WEINSTEIN, NETO/EDSAT, WASHINGTON, DC

Ms. WEINSTEIN. Thank you very much, Mr. Chairman, Senator Burns. I have just changed my testimony to read good afternoon from good morning.

And in the interest of time, I would like to address myself to one important question that you have invited in your request for testimony today. And this was how the Federal Government can allocate, most effectively, its limited resources to promote the use of telecommunications for educational purposes.

I am Shelly Weinstein. I am the president of the National Education Telecommunications Organization, NETO, and its subsidiary, the Education Satellite Corp., known as EDSAT, our voluntary education user-owned, user-controlled, and user-governed organizations.

NETO/EDSAT was created to link together an equitable, efficient, stable, and affordable space and land-based telecommunications infrastructure to deliver multiple services to schools, colleges, universities, libraries, and distant-learning centers.

I might add, you have heard from several of them here today, including the interesting TEAMS in Los Angeles unified school district.

Our vision is to build an integrated nationwide telecommunication system, a transparent highway that encompasses land and space over which teaching and educational resources can be delivered and shared with schools, colleges, universities, and libraries. Our vision is to wire together our classrooms nationwide and ultimately, internationally, through a single dedicated telecommunications system which can be accessed simultaneously through a telephone instrument, a computer, a fax, a video camera, and a television set.

It would be wonderful if every school could simply pay a single monthly service fee and have unlimited access to a transportation system that carriers information in all forms, video, voice, and data from almost anywhere in the Nation or world.

We are pleased to advise you something that is not in our submitted, written testimony today, however, a very historic event. And that is the NETO/EDSAT will provide satellite services as of August 1, 1992, and that is this Saturday if anybody has looked at the calendar recently, Senators.

We are cutting the ribbon on the I–95 for education in space, a space highway with secondary and access roads, cable and telephone, dedicated to delivering instructional education to this Nation's public and private educational institutions and workplaces for learning.

Well, we could identify it as the education satellite system, a dedicated satellite system with low costs, with nonpreemptable service for its educational users and with equitable access that is open to all educational programmers.

In the interest of time, let me just mention to you that we are frequently asked and you have heard some testimony today, what is NETO/EDSAT comparable to? Did not Congress already create this when they created the Public Broadcasting System.

The answer to the latter question is no. PBS is a broadcaster, a programmer. It uses its transportation system to deliver its excellent programming. My children grew up on it. I still watch it and I am a strong supporter of it.

But NETO is not a programmer and a broadcaster. It is a user's organization some people like to say, similar to a "user authority" much the same as we have created for other transportation systems in the country. It is an education user's organization, creating a transportation telecommunications infrastructure.

As such, our policies must be inclusive. They must provide equity in pricing and open access to the system for all instructional programmers. There is a precedent, however, for NETO. If I might take the liberty, Senator, and say in the year you began your service in Congress in 1963, Congress and the late President John F. Kennedy had great foresight in creating Comsat/Intelsat through the Communications Satellite Act.

The United States showed great leadership in creating a nonmilitary commercial, global communication highway that has benefited this Nation specifically and the world's economy and society in general.

I might add a personal view. In all the research that we have done over the years on this, in hindsight, looking back over the last 20 years asking why we have not had substantial growth in the education sector, it may have been the assumption that the military and the commercial networks were sufficient to address the education sector needs, which in and of itself is a major sector in this country.

NETO is a modified Intelsat. Its board of directors is made up of heads of States, colleges, schools districts, communications directors and private sector representatives. In fact, if you looked at the policy and purposes paper, NETO has submitted in testimony, you will find that it is modeled directly out of the legislative history of the Communications Satellite Act.

The list of NETO's board of directors representing the public interests in serving the system is attached in the testimony. But, if I might take just one moment and tell you that in our audience we have David Taylor, Dean of the College of Education of Western Illinois University. We have Glen Kessler, Director of Communications for the Fairfax School District. We have Mabel Phifer sitting next to me who you will hear from later on.

We have Mr. Rob Schuman of the ACSN which is a foundation, Senator, who can respond to some of the questions. ACSN is a cofounder of the Learning Channel, they are collaborators in building the system, and, I believe, there is a representative of George Washington University here. All of these are serving in leadership positions. We hope you will have an opportunity to meet with them to get their first-hand perspectives as providers and users of satellite instructional programming.

Although the precedent for NETO flows from the Communications Satellite Act on the Government side; on the private sector side, its precedent is comparable to the history of the cable industry, when a large group of entertainment programmers decided to pool their programming strength, they moved to one satellite.

The U.S. cable industry, as we all know, is more than 40 or 45 years old in this country. Its growth for all intents and purposes was flat or level up until about 15 years ago, when entertainment program providers, two, such as HBO and WTBS, decided to get together and realized that "access" meant having satellite dishes focused on one bird.

The explosion in the cable industry and access to more than 60 million homes which in turn have access to multiple program choices, 30, 40, 50 channels in my own home and in your homes, is history and we know that it is available, but it's a testament to the importance of education programmers collocating to one satellite system. There are about 20 major education program providers who represent only about 18 percent of the existing 111 program providers.

These 20 expended approximately $45.5 million, that is State and local dollars, in the 1990–91 school year just for satellite time. More than 16 percent of our school districts—and I do not think it is enough, but it certainly is growth—have some receive equipment. Overall, there are more than 55,000 education receive sites in this nation.

Despite this explosion over the last several years in usage and spending, with few exceptions most schools have access to only one channel at a time during the schoolday. I might add, having grown up in a four-room schoolhouse myself, there is not a school that I think any of us can think of today, whether it is rural, whether it is suburban, or urban, with a small population or a large population, that teaches only one subject at a time if there are more than two students in that building.

My testimony which has been submitted, includes a graph that shows the location of our current satellites, spread over 15 or more orbital slots where the schools, colleges, educational TV, ITV, PBS, private and public education programming consortia presently are located. They bought more than 75,000 hours of satellite time in the 1990–91 school year, and together they have spent more than $50 million.

In addition to this kind of fragmentation, in addition to the fragmentation and disorganization in access to program choices for the receive sites, what this also shows is that the program providers and users are left without predictable and equitable access, and without low-cost services that they need to maintain program service.

NETO, as an education user-controlled organization is bringing together education program providers to open access for multiple choices of programs for educational institutions. This is in much the same way that the cable programmers joined forces for the benefit of cable TV and the consumers. If I could just take a moment, Senator—well, you can see this map without my standing up, I would like to show you just what has happened in 6 weeks time when the education program providers learned that there was satellite available which is dedicated to instruction at low costs and nonpreemptible.

This was after about 6 weeks of public access, and what you see across the country represents public school districts, higher institutions of education, State departments of education, Federal agencies, public and private consortia, and educational TV. The red dots are programmers that are using 1,000 hours or more in the course of a school year to provide programming throughout the nation.

The green dots are those programmers that are delivering 100 to 900 hours. The yellow, which is a little difficult to see, but they are under 100 hours. The little orange dot in many of them represents the programmers that are delivering to Alaska, Hawaii, and the Caribbean. This in itself is pretty exciting when you realize that in 6 weeks time when the uplink program providers heard that there is a satellite they can move to, to collocate for low cost and predictable service.

But, there is even something more exciting. There is not on this U.S. map there is not any new programmer. Every one of these program providers have been delivering educational, or as some call it, distance learning, for many years. Each of them has anywhere from 100 to thousands of schools, workplaces, hospitals, health centers and others for which they are delivering educational instruction.

Prior to this, their downlinks were focused just for that one programmer. What this map shows is that if you turn this around now and think about all of the downlinks that now have access in just 6 weeks time as they refocus their dishes on the same bird, they will have access to multiple choices in programming.

The projections show that based upon the numbers of programmers that are out there, and we are encouraging new programmers, based upon the new programmers that are out there, I believe I had originally projected that by the end of this school year, 1992, and school year of 1993—that we would probably have 35 to 40 education programmers. I am told that is a very low estimate and probably, by the end of the school year, this will be more than doubled in terms of the number of available programs.

Now, if I could very briefly go to your question, what should the Federal Government be doing? Well, what does the Federal Government do best, is the question I like to ask. Historically, its role, in addition to research and development which is very important, its role has been to build infrastructure.

Felix Rohatyn, writing in the Washington Post on July 6, in his article entitled, "Self-Defeating Myths About America," makes this point in calling for the Federal Government to supplement existing State and local government efforts to rebuild America by investing in infrastructure. When I ask myself the question, what should the Federal Government be doing, I think of my own Federal experience as an official in the Secretary of HEW's office, and as a member of President Carter's White House energy policy and planning staff.

I am always reminded of the child's poem about a little girl with a curl in the middle of her forehead and when she is good she is very, very good, and when she is bad, she is horrid. In my view, when the Federal Government does what it was intended to do it does it very, very good. We cannot get along without it. And when it tries to do what the private sector and States, and educational agencies, and local communities can do, it turns out pretty horrid.

Government protects the public interest and the public is best served through standards, and there are many in this country today who believe that in this modern day of a global information society and economy, a standard for communications must be "access." NETO is a public-private coventure between State and educational agencies, satellite vendors in this case, GE, American Communications, cable companies, and hopefully, soon to include telephone companies, who are slow to recognize their role in satellite delivered distance learning.

NETO is not suggesting Federal subsidies. The State and local dollars are already being spent and will continue to be spent. Senator Burn's bill, S. 2377, for loan guarantees, places the Federal Government in a historical role as the silent partner with the private sector when there is a larger public interest at stake. It would minimize the risk to the private sector at the same time that the State and local education agencies continue to grow, and that there is little or no cost at the Federal level.

I might add that in terms of the loan guarantees, when I was in the Department of Energy and deeply concerned about the environment and economy, one of the most important things I think that we were able to do in the experimental programs with alternative energies, geothermal, the University of Hawaii, several private sector companies, we found that loan guarantees to the private sector encouraged research, encouraged development and application in a way that could never have been done had the Federal Government paid for the entire thing.

In closing, if I could just take a moment and tell you, that as a people, Americans have a long history of looking forward, always striving to make things better. As a nation, we have learned that transportation infrastructures are effective and economical when they provide access to and for increasingly greater numbers of users, when the primary systems link and interconnect through multiple secondary systems, both those that exist and those still to be built.

America's interstate highway gave the American family access to employment, housing, education opportunities, and other social benefits which far exceeded our greatest expectations and dreams. For those of us who share this vision for the information age, there is no doubt that even greater economic and social benefit will accrue from an integrated telecommunications system that transports America's rich and abundant educational resources to all children and adults, regardless of their wealth and geographic location. Thank you.

[The prepared statement of Ms. Weinstein follows:]

PREPARED STATEMENT OF SHELLY WEINSTEIN

The National Education Telecommunications Organization (NETO) is a non-profit, voluntary "education users" organization established to govern, purchase and manage affordable and equitable satellite and other telecommunications services on behalf of all America's schools, colleges, universities, libraries and other educational institutions. The EDSAT Corporation is a wholly owned subsidiary of NETO established to operate and manage the satellite services.

The NETO/EDSAT Board of Directors include; Robert C. Albrecht, University of Colorado; Marshall Allen, Oklahoma State University, Sarah Carey, Steptoe & Johnson; Joseph Duffey, The American University; Jack D. Foster, Center for Strategic Policy Studies; Ben Hambelton, Boise State University; Jack Hannon, COMSAT; LaDonna Harris, Americans for Indian Opportunity; Smith Holt, Oklahoma State University; Glenn Kessler, Fairfax School District; Ralph Meuter, California State University at Chico; Mabel Phifer, Black College Satellite Network; Sidney Pike, CNN International; Pamela Quinn, Dallas County Community College District, Texas; Grier C. Raclin, Partner, Gardner, Carton & Douglas; Harlan Rosenzweig, Westinghouse Communications; Mark Spear, ALCOA; David R. Taylor, Western Illinois University; H. Brian Thompson, LCI International; James Tomsic; Shelly Weinstein, NETO; Arthur Wise, National Council for the Accreditation of Teacher Education; Wallace G. Wilkinson, former Governor, Commonwealth of Kentucky; and Dennis Rehberg, Lieutenant Governor, State of Montana.

We'd like to begin with what we think is an important element in your quest to improve American education through greater and better use of technology.

Our vision is to build an integrated, nationwide telecommunications system, a "transparent highway" that encompasses land and space, over which teaching and educational resources can be delivered and shared with schools, colleges, universities, and libraries.

Our vision is to "wire" together our classrooms, nation-wide (and ultimately, internationally) through a single dedicated telecommunications system, which can be accessed simultaneously through a telephone instrument, a computer, a fax, a video camera and/or a television set.

It would be wonderful if every school could simply pay a single, monthly service fee and have unlimited access to a transportation system that carries information in all forms—video, voice, and data—from almost anywhere in the nation or world.

You might ask why a dedicated telecommunications highway is a "critical" element and what the obstacles are to making this vision a reality. There is a well-documented crisis in American education. The recently released National Goals Panel report hammers home the inadequacy of the present education system. Added to these outcome problems are those of state budget deficits, teacher shortages, retraining needs, mounting problems for youth-at-risk, and increasing costs for delivering programs and teachers for the underserved and the unserved. In the face of this there can be no doubt that states must make the most cost-beneficial use of public resources and teachers if they are to succeed in improving the quality and productivity of America's schools.

Technology has rapidly transformed every sector of our lives—except education. A nation's economic development and productivity are closely tied to telecommunications development, which constitute the electronic information transportation system. In our view, if this standard was applied to America's telecommunications infrastructure available to education, America's education sector would roughly compare to that of a developing nation. In testimony by the U.S. Chamber of Commerce before the Subcommittee on Technology and Competitiveness, U.S. House Committee on Science, Space, and Technology (June 18, 1991), it was pointed out that today the U.S. invests:

> only about $100 per student in education in computers and capital investment; this, compared to $50,000 per worker in private industry, and $100,000 per worker in high-tech firms. While the rest of America created a $20 billion-a-year industry by putting 45 million personal computers into use, during the last ten years, United States schools acquired a mere $2 billion of personal computers.

Although telecommunications has turned the world into a "global village", America's schools for the most part have remained relatively isolated enterprises. Access to information is critical to a knowledge-based enterprise like education. The educational resources available in this nation and around the globe are rich and growing exponentially, but the United States does not have a technologically integrated telecommunications system available to "transport" these educational and instructional resources from one place to another.

Unquestionably, an integrated, satellite-based telecommunications system linked with existing cable and telephone lines holds a piece of the promise to provide a quality educational opportunity which is equitable and affordable for all youth and adults, regardless of the wealth of their community, geographic location, or the density of their community's population.

What are the obstacles NETO is addressing? They are systemic, widespread, and more policy than technical In nature:

1. The education telecommunications market is highly disorganized and fragmented;
2. Within existing commercial market practices1 educational institutions are left without low-cost, dependable, and equitable access to telecommunications services;
3. There was an absence of a national organization to represent education and state agencies to create a total education telecommunications system using multiple communication technologies.

These problems were highlighted at the 1989 Education Summit in Charlottesville, Virginia when former Governor Wallace Wilkinson of the Commonwealth of Kentucky and other governors raised with President Bush the need for a dedicated education satellite to be built and launched as a partnership effort between the states and the federal government.

In response to Governor Wilkinson's proposal, the non-profit EDSAT Institute issued a report entitled "Analysis of a Proposal for an Education Satellite" on February 26, 1991.

The report found that individual states and educational institutions are beginning to invest heavily in telecommunications technology. The communication technologies through which instruction is delivered at the local level includes optical fiber, coaxial cable, microwave, and fixed-based broadcast television as well as the receivers of satellite transmission. All land-based technologies are essential to a complete telecommunications infrastructure and satellites are the best means by which to distribute multiple education programs simultaneously to every part of a state and the nation at a relatively low unit cost.

The report found that the market to support an education satellite already existed. There were at least 111 program providers of satellite-based instructional programming. Of these, the 20 major education program providers purchased more than 75,000 hours of transponder time in the 1990-91 school year.

It was estimated that the same 20 major program providers spent at least $45.5 million during the school year for the purchase of transponders. Given that this represents only about 18 percent of the program providers, it is plausible to assume that the states spent substantially more than $50 million in the 1990-91 school year for satellite time.

Problems were attributed to institutional purchasing practices, buying more time than needed, rising costs, the inability to contract for large blocks over long periods of time, and little or no control over the system. There is no evidence that these buying constraints on educational and state agencies can be changed under current practices.

In response to the interest in the EDSAT report the Institute and 17 public and private sector cosponsors conducted seven regional outreach meetings across the country in 1991 to convene educational institutions, state agencies, educational T.V., satellite vendors, and other interested organizations and individuals to discuss creation of a voluntary organization—a National Education Telecommunications Organization (NETO)—for the purpose of providing affordable and equitable satellite and other telecommunications services.

More than 300 representatives of education and state agencies who use or were planning to use satellite and other telecommunications services to deliver instructional programming to students, teachers, state employees, and workers attended the meetings. They confirmed the EDSAT findings that present commercial market practices for satellite services were incompatible with the needs and requirements for education users and buyers. The issues which were at the top of the list in these discussions were the affordability, predictability, control, and equity of satellite services.

On the basis of this grassroots interest, NETO was incorporated on October 17, 1991 in the State of Delaware. NETO is governed by a Board of Directors representing a range of public interests. Its membership is comprised of former and current public officials, educators, state agencies, telecommunications experts, and private sector representatives. As a first step toward building an integrated land and space highway dedicated to cost-effective and equitable policies for the distribution of instructional and educational programs, NETO created an Education Satellite Corporation, a non-profit business subsidiary to operate and manage satellite services to affiliated education and state agencies.

To help understand what NETO is, first let me explain what It is not. It is not a "program provider". It is not a "network" and it's not a "satellite vendor or banker". A review of some of the existing "program providers' may help to clarify what makes NETO "unique" and unparalleled. First, examples of "program providers" are: Whittle Communications, The Learning Channel, The Discovery Channel, CNN Classroom News, PBS, etc. Each of these use satellite transponders and, in some cases, cable for the purpose of delivering "their" programs. In many instances, they buy one or more transponders, much like other real estate, because it keeps costs down and increases program effectiveness. However, owning these transponders is not their "primary" business. Their primary business is "broadcasting" and "programming".

Another example: PBS buys satellite transponders to provide network services to a family of 337 public television program stations. In some states these stations provide education to the schools. PBS, therefore, considers other education program providers such as state educational television networks, schools such as Oklahoma State University, California State University, Western Illinois University, National TelecommunicatiOns University, Black Colleges Satellite Network, the Fairfax County Public School District, etc. as "competitors".

When Whittle Communications installs a satellite dish at a school site, it does so to give access to the school for Whittle News programming. Whittle's primary goal is not to create a portion of a nation-wide highway or "infrastructure" that will facilitate transportation of their competitors' programs. PBS's goal to create a critical mass of satellite capacity with public monies is not to build an infrastructure to transport more and more competitive programs. PBS wants increased transponder capacity for its 337 public television stations to add revenue sources and outlets for PBS's programs.

These distinctions are critical in the search for answers to the question of how to put telecommunications into America's classrooms. On the one hand, an organization which seeks to buy and build a transport system for its programs must reflect policies of exclusivity, preferential pricing, and limited access On the other hand, NETO's goal is to create a dedicated telecommunications transport system with open access to all existing and not-yet existing educational instruction programming for America's classrooms. This goal, by necessity, will create policies of "inclusivity, equity in pricing, and widening access".

Briefly, the other category was "satellite vendors and brokers". Examples of satellite vendors are GTE Spacenet, Hughes Communications, GE Americom, AT&T Communications, PanAm Sat, COMSAT, etc. These are private sector owners who sell satellite time and services. Brokers are companies that buy up large blocks of satellite transponders for resale to companies, schools, governments, etc. On the not-for-profit side, some people place PBS in the "satellite broker" category because it is seeking public monies to buy-up transponders to sell to schools and other institutions.

NETO is not a satellite vendor and it is not a broker. It is not buying satellite transponders and then going out to "sell" its time. It is an education's users organization established to control its own destiny. It will govern, purchase, and manage satellite and other telecommunication services for its users. Its users are education institutions, school districts, and state agencies. I previously mentioned that a barrier was "more policy oriented than technical"; these policy issues are exclusivity versus inclusivity, preferential versus equitable pricing, and limited versus open access. If we are serious about a revolution in American education then we must look to long-term, comprehensive change—not applying band-aids to existing problems.

Collectively, the education sector has the potential for being the biggest "users" and "buyers" of telecommunication services in the United States. It has unique and discreet practices, missions, and the public interest to protect. NETO's policies are to expand and encourage small and large education program providers to enter and sustain their presence in the field through affordable and equitable access to an open telecommunications highway that links to 110,000 schools, 3,000 colleges and universities, 6,000 libraries and state and local governments.

In closing, as a people Americans have a long history of "looking forward", always striving to make things better. As a nation, we have learned that "transportation infrastructures" are effective and economical when they provide access to and for increasingly greater numbers of users and when the primary systems link and interconnect through multiple secondary transportation systems, both those existing and those still to be built. America's interstate highway transportation system gave the American family access to employment, housing, education opportunities and other social benefits which far exceeded our greatest expectations and dreams.

For those of us who share this vision for the "information age". there is no doubt that even greater economic and social benefits will accrue from an integrated telecommunication system that transports America's rich and abundant educational resource to all children and adults, regardless of wealth and geographic location.

Senator INOUYE. I thank you very much, Ms. Weinstein. You have suggested in your prepared text that the education telecommunications system is highly disorganized and fragmented, and that there is no national organization to represent the various interests involved in education. You also spoke of access and that this is not available at low cost. How can we cope with these?

Ms. WEINSTEIN. Pardon me? It was available at low cost? We are making it available at low cost.

Senator INOUYE. What about the obstacle you spoke of, that the market is highly disorganized and fragmented?

Ms. WEINSTEIN. The education market is very disorganized and I am really glad that you asked, Senator. Here is what we found in our research. On the private sector side, the satellite industry, in its building and launching and its delivery of its services, the practice is for large investors to come in and invest prior to building or launching.

You will find that most satellites are being built today. Whether it is a cable bird, or a regular bird for other kinds of programming, most transponders are occupied, invested in, and bought before they ever get built. That is the way the industry is working today.

Second, for the time that is available, what the satellite industry wants to do is to have the buyer come in and buy ahead of time, pay for services before it is received. It is good business and it is the way the business has to be done. So, you have preinvestment; and large investment. There are yearly contracts where a company pays a year in advance before they ever use for a transponder, and they really do encourage buying a full transponder. That is about 8,800 hours of programming in the course of a year.

On the education side, what you have are State and educational agencies, public institutions who are bound by the State procurement practices. They have to pay for services after they are received. They frequently cannot even contract for a year's worth of hourly programs. So, there is a gap between the State and the educational agencies when they do business in the satellite commercial marketplace. The commercial marketplace needs to remain viable and profitable and cannot help the education sector to grow into a large user.

What NETO has been able to do—and we do need a great deal of help, we are not suggesting this should be done alone is create a true public-private partnership. By saying to the private sector, NETO represents the education users and the education users have now begun to realize that they can aggregate their purchasing power, they can aggregate the control and policies of this system. By doing this and by being a member of this organization, we the education users are a big buyer, so to speak, with a governing body of this system. NETO can be an equal player in the commercial marketplace to buy for education and to help them to work together.

Therefore, if the educators are together they can turn around and buy at affordable rates. What is normally done in the way they are doing business is that they are paying high dollar for services. Throughout the country in our seven regional meetings which we had reported on, we heard that low costs are very important, and that it is coupled with the predictability and equity of services.

Several universities came and said, I need to plan curriculum for the next 2 or 3 years. I cannot plan my curriculum unless I know where the program is going to be so that my downlinks can focus their dishes, so they have predictable service and equitable access. Costs and services are very uneven. That is the fragmentation and disorganization in the current commercial environment that the schools are trying to operate in.

Senator INOUYE. Thank you very much. Senator Burns.

Senator BURNS. You already answered all my questions. Have you been reading off my question thing here?

Senator INOUYE. No, not quite.

Senator BURNS. OK. I will have a couple of observations here.

Senator INOUYE. Well, I think your emphasis on the loan guarantee program makes good sense and this committee will look upon that very seriously and hopefully, favorably.

Ms. WEINSTEIN. Thank you very much, Senator.

Senator INOUYE. Now may I call upon Dr. Phifer?

STATEMENT OF MABEL P. PHIFER, Ph.D., PRESIDENT OF THE BLACK COLLEGE SATELLITE NETWORK (BCSN) AND THE CENTRAL EDUCATIONAL TELECOMMUNICATIONS NETWORK (CETN), WASHINGTON, DC

Dr. PHIFER. Thank you, Senator Inouye, Senator Burns. Let me say, good afternoon. When you are on the last panel and you have had as many presentations as we have had today, there is very little that I could say that would be new, therefore, I am not going to read my presentation, but hopefully, you will get a chance to read it in its entirety. But I would like to point out several important factors, key issues, then cite what I consider to be tremendous barriers to the direct answer of the question that you have asked and then make several recommendations.

But first, let me say that I am Mabel Phifer, president of the Black College Satellite Network and the Central Education Telecommunications Network, which is our K–12 network. The Black College Satellite Network may even be a misnomer for what we do. We service, yes, the 105 historically and predominantly black colleges in the United States. But in addition to that, we have some 356 nonblack members of that network who are nonminority institutions, higher education institutions in the United States.

In our K–12 network, which is the Central Education Telecommunications Network. We service over 65 public school districts in 15 States, the District of Columbia and the U.S. Virgin Islands. We reach over 2,200 public schools, teaching critical courses from 8 o'clock in the morning until 5 o'clock in the afternoon, with a rebroadcast to parents in the evening, via cable, so they have an opportunity to share in what their students have had a chance to be taught during the day, and to extend the educational community to parents as teacher-partners, and to give students a chance to brush up on what they are taught in the afternoon.

As we started this network in 1981 on paper, in 1982 in reality, we decided that we should not reinvent the wheel, but we realized that we were on the cutting edge, that in fact there were very few people who had put in place more than we had. We grew up with this distance learning community. We consider ourselves to be absolute experts in this area. One, I am an educator by training, by practice. I am not a technician, but I have learned to become one and will stand my ground with the best of them.

I am not a communications specialist, but over the past 11 years, I have learned to become an expert in that field and will stand my ground with the best in that area. Therefore, based on the words of an internationally renowned human rights expert some years ago, Mary McCloud Bethune, she said: "Let us leave no one behind." What we have done through this technology, is to level the playing field of education and say to America, you must address the needs of all its citizens.

Therefore, we seek to serve all who have been left behind and we say, technology is the door to do that. But there have been some barriers and there still are barriers. One, we talk about all's well in the education arena. But let me say that I sit on the board of directors of just about all of the major national networks, the United States Distance Learning Network, the University Telecommunications Network, the now defunct Public Service Satellite Consortium, EDSAT, NETO, and many, many others.

But let me say, at each and every meeting we talk about the problems, so when we come before distinguished public servants like you, we must say that there are problems. One, yes, there are a lot of satellites in orbit. I am a guest at NASA for many of those launches, but let me also say that we must find the adequate dollars to purchase the satellite time. Yes, there are many programs in existence, but they end up being out of 100 and some applicants in 1988, for the first round of STAR schools, there were four awardees.

Out of the second round of STAR schools, there were about 45 applicants and there were 4 awardees, and we happened to be one of those fortunate enough to become a STAR school recipient.

We got the lowest award grant of all of those. And out of that, we still broadcast over 1,000 hours of distance-learning programs to public school districts that could not afford to pay the top price that many people paid.

So, we took it upon us as a commitment to go out, and through the private sector and the public sector, secure the additional funds necessary to broadcast not only advanced placement programs in science, math, foreign languages, in the humanities, but also calculus course for those students who were not advanced placement. But believe me, using the technology they have, in fact, learned calculus. They have learned physics.

The teachers have not been threatened by technology, because we try to say to them this is the wave of the future and the future is now. And what we want to do is to teach you how to become a user of technology, how to integrate it into your existing curriculum, and how to expand your access and opportunity for your learners. And for expanding the community of educators to make parents, community leaders, administrators, all partners.

So, what we need? We need more access. We need nonpreemptable time because we must generate revenue. Last year I had to terminate a contract with one of our major private sector vendors because every other day when I arrived at work, there was a fax saying your calculus course, your biology course, your Russian course, has been preempted and therefore we are switching you to another satellite.

So, what do I do? How do I get that message out to all of my schools in an hour or two when many of them do not have fax machines, many of them do not have telephones in the classroom, and therefore I could not speak directly to the teachers. So, we said to this vendor sue us, that is all right. We are cancelling this contract, because there has to be a better way.

So, we need nonpreemptable time. We need more telephones in the classroom, and we need the telephone industry to give us better rates.

In addition to our satellite network, we have a compressed video network where we link schools that do not have uplinks. They bring their signals in to us using a full T–1 line into our Codex and we take it out by Ku Band satellite and turn it to C Band for the widest distribution possible.

But we have been haggling over the last 4 months, trying to come up with terrestrial land rates—terrestrial rates for our telephone connections for those compressed video units. And I am not talking about digital compression, I am talking about compressed video using land lines. So, we need to have some way to standardize rates for educational use, for terrestrial use.

We also need to look at this whole effort that is underway about digital compression. Who is going to pay for encoders and decoders? I actually took the time and energy to raise the money, some $6.7 million, to put downlinks at colleges and universities, community colleges, and other centers that we serve. I am not willing to raise—and because we use the larger satellite dishes, the cost of the decoders for my users will be somewhere in the range of about $480,000 and some people have even given me a price of $8,000.

And for all the users we have, colleges and universities and public schools, I am not willing to try to figure out how to raise the money to put those encoders. And yes, it could save us on satellite time, but someone must make the initial investment to put the decoders at the downlink sites so we can broadcast and our sites can receive signals using digital compression.

There is another technicality that gives me a great deal of concern about digital compression. I have spent a great deal of time with each of the major vendors that have created the hardware and the concepts behind digital compression. And to date, none of those vendors have equipment that talked to each other.

Those of us in this industry have spent many many years trying to collaborate, cooperate, and not reinvent the wheel. I collaborate with cable, with everyone, with all the major presenters you have heard here today: TEAMS, STEPS, Missouri School Boards, on and on and on. But if I buy digital compression from one vendor and TEAMS buy compression unit equipment from another and STEPS buys from another and Missouri School Boards from another, there is no interoperability, no way we can talk to each other. The equipment does not have that kind of standardization.

So, I say that we must say to the industry standardize your hardware, because we in this industry, in the distance-learning arena, need to talk to each other. So, we need your help in that area.

There are so many things. Simple things like just a telephone in the classroom would help. I just want to share one statement from a quote of Harland Cleveland's. And he says "that people who do not educate themselves and keep reeducating themselves to participate in the new knowledge environment will be the peasants of the information society." The second is "that societies that do not give all their people an opportunity for relevant education, as well as periodic opportunities to fine tune their knowledge and their insights, will be left in the jet-stream of history by those who do."

I contend that the Federal Government can help all of us become the users, the recipients of new technology. I say that we need to be colocated. We need your assistance in doing whatever can be done to expand Star Schools. I beg to differ with the Department of Education; I think we need more money. I think we need colocation. I think we need each other. I think we need to share programs, we need to cooperate, we need to collaborate.

I would also suggest in closing that all Federal agencies need to be brought to the table. They need to identify what pool of resources they have available for technology in education, and we need to not duplicate but we need to collaborate and cooperate if we are, in fact, going to be the leaders in a new millennium. Thank you.

[The prepared statement of Dr. Phifer follows:]

PREPARED STATEMENT OF DR. MABEL P. PHIFER

I am Dr. Mabel P. Phifer, President of the Black College Satellite Network (BCSN) and the Central Educational Telecommunications Network (CETN) located at 500 N. Capitol Street, N.W., Washington, D.C. 20001.

I am very pleased to be a participant in this hearing, testifying as a member of this august panel of experts. My presentation will include critical information on the use of telecommunications technologies for our Nation's schools and universities. The following quotes spanning over 140 years are offered to set the stage in support for widespeard use of technology applications in our Nation's schools and universities.

> "Education, then, beyond all other devices of human origin, is a great equalizer of conditions of men—the balance wheel of the social machinery."—*Horace Mann, 1849.*
>
> "Education, utilizing state-of-the-art, integrated technology applications provides greater access and opportunities for all people, regardless of geographic location, race, or socioeconomic status. * * * Technology Levels the Playing Field of Education."—*Mabel P. Phifer, 1992.*

The Black College Satellite Network is a comprehensive telecommunications organization integrating state-of-the-art technologies to deliver programs to and from colleges and universities (including historically Black Colleges and Universities), public and private schools serving students in pre-K through grade 12 with a major focus on science, math, foreign languages, and in-service programs for teachers and administrators serving at all educational levels. The Network's primary broadcast coverage includes 23 states, the District of Columbia and the U.S. Virgin Islands. In addition to educational institutions BCSN provides production, editing, transmission capability as well as, the promotion of special events, cultural activities, telelectures, teleconferences, and telecourses to federal agencies, community organizations, churches, businesses and major corporations for the purpose of education, recruitment, training, and other information transfer projects/programs.

The Central Educational Telecommunications Network is a distance learning network providing programs and services to urban, suburban and rural local education agencies (LEA's), utilizing state-of-the-art telecommunications technologies. CETN is managed by the Black College Satellite Network. BCSN has 10 years experience developing and operating comprehensive telecommunications programs for colleges and universities, national organizations, federal and state agencies, churches and other educational institutions. The Network's programs feature master teachers, noted lecturers, corporate trainers and other outstanding professionals from diverse disciplines.

Over 65 LEA's in 12 states, the District of Columbia and the U.S. Virgin Islands receive strategic high school, middle and elementary school courses that are taught by colleges and universities through CETN. These courses are delivered through the use of multiple technologies—satellite, cable, fiber optic and digital compression.

The focus of the Network is "Expanding Educational Excellence" through technology. The CETN broadcast quality, interactive telecourses to title I-eligible, traditionally underserved students and advanced placement students. The schedule is designed to enhance the educational experiences, opportunities, and academic performance of students served.

The CETN programs provide courses at all academic levels, basic through advance placement, as well as extensive staff development teleworkshops for pre-service and in-service teachers. These teleworkshops enhance the future quality of teaching in our public schools, and help our teacher-force grow skilled and confident in distance learning instructional techniques.

CETN offers telecourses for students and staff development teleworkshops, the CETN "ADVANTAGE" includes:

- Courses delivered by master teachers
- In-service training and skills-development workshops for teachers in the art of telecourse instructional practices
- Pre-service courses and workshops for teacher education majors
- High-quality interactive satellite learning opportunities for students
- Team teaching between telecourse teachers and classroom teacher-partners
- Monthly staff development through interactive in-service teleworkshops, featuring interactive audio, one-way video, teacher-to-teacher E-mail, and FAX communication.

THE RATIONALE

BCSN/CETN were created to enhance, enrich, and expand the quality and availability of curricula, as well as personal and professional development programs for students, faculty and other community persons. The Networks, utilizing state-of-the-art technology, are delivery systems capable of increasing educational opportunities for all individuals working to obtain a quality education.

The Networks include reliable transmission of interactive video, voice and data. This capability opens new vistas for educational institutions in the areas of curriculum expansion, in-service workshops, student recruitment, fundraising, collaborative research, public relations and institutional image-building.

BCSN/CETN are non-traditional approaches to facilitate the teaching/learning process. They allow faculty to teach traditional subject matter in more effective ways while introducing new subject matter to a diverse student population.

The cost effectiveness of this new technology permits more inter-institutional sharing of new and innovative programs.

DISTANCE LEARNING

The Black College Satellite Network is committed to providing a greater access and opportunities to the underserved students of the Nation. Using technology as an educational tool, BCSN provides an effective way of facilitating innovative instruction. Through the Central Educational Telecommunications Network, an array of foreign language, science, and mathematics telecourses for elementary, middle and high school students in urban, suburban and rural communities are delivered. Pre-service and in-service teacher education programs are offered to faculty and administrators working at all educational levels.

NETWORK COLLABORATION

BCSN/CETN has established collaborative arrangements with all educational telecommunications networks and telecommunications systems for the exchange of programs and other information transfer opportunities.

Corporations and federal agencies have made available technical and non-technical courses, special interest programs and extensive training materials for use on the Network.

THE TECHNOLOGY

BCSN/CETN are educational programming services broadcasting primarily via a high powered Ku-band satellite and turned to C-band for broader downlink reception.

The Ku-band technology increases the quality of reception in video, voice and data transmission and helps to alleviate terrestrial interference.

BCSN has teleconferencing facilities to transmit interactive programs using digital compression ranging from 384 kb up to T-1 capacity.

A self-contained fully redundant Ku-band uplink and remote production vehicle is used to produce programs from any location.

THE BARRIERS

- Space segment availability (the hours needed during the school day for broadcasting distance learning courses—prime time).
- The escalating cost of space segment time (transponder cost). The rate for occasional time has increased approximately 34 percent over the past three years. The more time educational users buy, the lower the rate per hour. The BCSN/CETN's aggregated costs for Ku-band and C-band time and the cost for turning to C-band exceeded $1 million for 1991–92 academic year.
- Consistency in location on a satellite and/or certain transponders. Schools without a technician have to charge their downlink location in order to find the programs on short notices.

BSCN/CETN found it necessary fo cancel a contract with Great American Telecommunications Services for C-band time because courses were being bumped without enough lead time to notify the schools. These constant changes lead to the cancellation of CETN programs by several school districts and a loss of revenue by the Network.

It is difficult and costly to inform schools of satellite/transponder changes since there is no data network linking all educational institutions for information transfer, and many school buildings do not have access to fax machines. Telephone contacts are virtually impossible and inconvenient since calls are taken in the administrative offices rather than the classrooms.

This lack of telephones in the classroom is also a barrier because it hinders the students interactivity and participation with the distance learning teacher.

The quality and standards that have been established by the distance learning community include sound educational and production values that meet or exceed both course accreditation and broadcast standards. This criteria has been set by professionals who are the program providers.

The professionals in the distance learning community are capable of maintaining and monitoring program quality. The end users—the students, teachers, administration, and parents enforce this accountability in a competitive marketplace.

As providers of distance learning programs for pre-K through 12, higher education and continuing education we are a major user of satellite time (over 2,000 hours annually). We support the National Educational Telecommunications Organization's efforts to aggregate and manage dedicated space segment time for educational users. The benefits accrued to this consituency include:

- Lower cost for transponder use
- Greater access during the school day
- Consistency in satellite coordinates for telecourses and special event programming
- Continued positive growth in the distance learning community
- More telecourses and teleworkshops for students and faculty
- Opportunity and access for urban, rural and suburban students who need the educational services
- Improved telecommunications capability to deliver quality education to local educational agencies that are unable to provide it for their students
- More cost effective delivery system that can share master teachers to a nationwide classroom
- Make policy decisions affecting the educational providers and users

Indeed, telecommunication technologies can play an increasingly important role in the delivery of instructional materials to all of our Nation's school and universities in order to level the educational playing fields for all students. The advantages of using integrated technology applications in education include:

- Greater access and opportunity
- Instruction is multidimensional
- More efficient use of instructor time/student time
- Reduces duplication of course development and greater variety of offerings

- Consistent superior level of instruction
- Smaller classes that are cost efficient
- Expands the "Community" for both students and teachers
- Leverages available school resources
- Involves the parent as a teacher partner
- Students become active learners

I would like to close with one of my favorite quotes from Harland Cleveland:

> "There are two predictions to which I would assign a high probability of value. The first is that people who do not educate themselves—and keep reeducating themselves—to participate in the new knowledge environment will be the peasants of the information society. The second is that societies that do not give all their people an opportunity for relevant education, as well as periodic opportunities to fine tune their knowledge and their insights, will be left in the jet stream of history by those that do."

Senator INOUYE. Dr. Phifer, I thank you very much. You spoke of standardizing equipment, transponders and such.

Dr. PHIFER. Not transponders; digital compression equipment.

Senator INOUYE. Do you think it is the role of the Federal Government to bring about the standardization?

Dr. PHIFER. No, no. I am not suggesting that. But we know that all of the industries that develop this equipment have inroads to the wishes of the Federal Government. I am not suggesting legislation; just a little leaning on is sufficient. [Laughter.]

Senator INOUYE. Well they seem to object to the leaning on. [Laughter.]

Dr. PHIFER. We do it anyway though, Senator. You know how to do that gently.

Senator INOUYE. Well we are gentle people here. [Laughter.]

There are very many tragic statistics. I think all of us know about the functional illiteracy and illiteracy. Would these programs provide any relief to the dropout situation? I am talking about the classroom, now.

Dr. PHIFER. I think so. And we are working with national organizations such as the National Urban League, the National Council of Negro Women, and many other national organizations—the National Urban Coalition, the National Science Foundation—to really look at how we develop programs that can be shared nationwide using technology to curb many of these.

I can even cite some programs—and, as I said, I cut out a lot in the essence of time, but would offer to you that we are a very comprehensive network. We do not just limit our services at the door of educational institutions, but we work with churches. We have developed a church network because there are many parents and grassroots community people who will not come to the schoolhouse, unfortunately, but they will come to church. So, we decided to take the school and the educators and the programs to the churches, to the housing development units.

We have put downlinks in housing development units so we can begin to teach individuals who will not go anywhere, but it will come into their home—I mean in terms of a formal educational program. But if we can deliver these kinds of programs into their home, and it is making an impact. We decided that we should use the technology to go to where they are, and it is working.

There is a lot to be done. There are a lot of people to convince, and even to help them understand what the technology is capable of doing. But we are determined to bring them kicking and screaming into the 21st century.

Senator INOUYE. One of the criticisms leveled at our educational system is that the system is not relevant to the real world, that we do teach many exotic and exciting things but it does not help the young student to get a job. Are you concerned about the real world?

Dr. PHIFER. Yes, we are. And we have been working with the National Urban League on some of their grassroots programs to deliver programs to that constituency. We have also been working with Secretary Lynn Martin in some of the initiatives in the Labor Department to look at opportunities.

We have bought into the idea that this technology can help; it is good for everyone. We have gone to the private sector to talk about career opportunities, training opportunities. We have even used the technology as a teaching modality to say to students here is a way that you can have a career.

In working with the Justice Department and some programs that they had for schools that were under consent decree and court order desegregation, we have been able to leverage those schools that were 99 percent black into magnet-plus schools, using technology as the leveraging agent. Where we have gotten students who were dropouts—who would have been dropouts who actually testified that the reason they were in school today is that we offered them a new opportunity and a new hope.

We can give you endless examples of how we are trying to use it in nontraditional ways, and that is one of our driving mechanisms.

Senator INOUYE. Thank you very much, Dr. Phifer. Senator Burns.

Senator BURNS. Dr. Phifer, I do not know how many fans you have got around this country, but you have got one here. Because it sounds like you just kind of grabbed a hold of the bootstraps and kind of taught yourself all the way through this and you worked your way through it in a very practical way. And so you bring to this committee, I think, a very practical knowledge on what has to be done and I congratulate you for that and we appreciate it.

Dr. PHIFER. Thank you.

Senator BURNS. One of the reasons why I am such a fan is because when Ms. Ayala was testifying I wrote down a couple of notes here saying that as far as parental education is concerned, where parents are reluctant to come down to the schoolhouse at an appointed time—they are reluctant to do that, so we have to reach them where they are, which is in the home.

In other words, either one of them or a single parent gets home from work. They are tired. They are looking for kick-back time, and if it is available at their fingertips either by the telephone, which I say that is the reason broadband telecommunications is necessary into the home, that is our access to them and that is the reason it has to be for all Americans, just like you say.

I wish, right now, with all this practical experience that you have and the tremendous knowledge that you bring to this body—and you as a programmer, I think you brought about the problems we are running into—with what I questioned the man from the South

Carolina Public Television is the problems we run into with, say, even trying to further the project of Telestar 401.

I wish you might relate to this committee on what kind of problems that presents to you.

Dr. **PHIFER**. Well, it depends on what kind of equipment they choose. At this point, as program providers, we do not even have the choice unless we all make a conscious decision to go with the same identical vendor, to have interoperability, to be able to talk to each other using compression.

And let us say that we all decided we would go on Telestar 401—and I listened very carefully to the questions that you posed about open access. Because, you see, even if it were cheaper, I would not go on any network that decided they had to put their logo on my programs. I have made it for 12 years; we would struggle for 12 more.

But even if we decided that, we all must then go to the same vendor. If I decided today to go with one technology—and I will not call vendor names, but if I decided to use one compression technology, and as I said I have spent time at each and every one of these plants learning the difference between the technologies for digital compression. And right now they cannot talk to each other.

And so we would all then say yes, everybody in the educational market—and maybe that is not all bad, maybe we could drive the prices down because the critical mass can drive the market. And so as it stands today, unless we all chose the same vendor we could not even go on to Telestar 401 because the encoder that you choose determines the kind of decoder that you must have at a downlink site.

So that would take some tremendous orchestration. If everyone in the industry—and eventually we are going to have to get there. But as I said, I do believe we can help drive the marketplace as an educational user constituency going in and saying if all of you want to sell to all of us, you are going to have to develop equipment that can talk to each other, that there are some levels of interoperability.

Senator **BURNS**. That is all the questions I have. I am interested in hearing from Mr. Wright.

Senator **INOUYE**. I thank you very much. We have done that in many other instances, VHS——

Dr. **PHIFER**. Oh, sure.

Senator **INOUYE**. Tape records.

Dr. **PHIFER**. With compressed video we have now international standards, and I am sure it can be done with compression. But you know you always have to make some money off of the top before you do that.

Senator **INOUYE**. And somebody has to do some leaning. [Laughter.]

Thank you very much.

Dr. **PHIFER**. Thank you.

Senator **INOUYE**. Mr. Wright.

STATEMENT OF PAT WRIGHT, DIRECTOR, TCI EDUCATIONAL SERVICES, ENGLEWOOD, CO

Mr. WRIGHT. Thank you, Mr. Chairman, Senator Burns. I appreciate the opportunity to appear before you today. I, like Dr. Phifer, realize that you have been sitting for a while and you have heard quite a bit of testimony.

I came somewhat prepared today to talk specifically about cable in the classroom applications. But for a couple of reasons, the chief among those is that I do not think I could improve on John Kuglin nor his students, or the excellent testimony of Mr. Clifford earlier this morning. I will move away from some of the specifics of cable in the classroom and try to direct my comments to some of the issues which have been raised here this afternoon concerning issues which surround the technology.

I am relatively new in my position as director of education services with TCI. In fact, it is a newly created position within the company. Prior to joining TCI I was a classroom teacher for 8 years, an assistant principal for instruction and curriculum, an associate principal, and a principal for 5 years.

During my tenure as a high school principal in a small town, rural area of northwest Georgia I, along with the staff members and community, started to address some of the issues which have been raised here this afternoon. How do we restructure the teaching learning environment in an information age in a technical society?

Through a great deal of research and introspection and analysis of existing technologies and so forth, it turned out that a lot of what we were looking for in terms of readily available tools which could fundamentally change the way students perceived education and teachers went about their duties of teaching were really available right in our own backyard.

And although I had read a great deal about emerging technologies and so forth, and satellite systems and optical fiber and so forth, it turned out, at least in our case, that we were able to get a good start using an existing infrastructure with the help of partners that were available in our own community. And I speak specifically of the cable operator in our area, P Street Cable, a TCI company. And we began to restructure education using some of the resources that Mr. Kuglin highlighted in his testimony earlier today.

Through that process, however, we very quickly realized that this restructuring issue that we are all dealing with is really a two-sided issue. One is the issue of the technology itself; what I like to refer to as the bells and whistles. Quite frankly, in my opinion that is the easiest part. The fact of the matter is the future is here and it works pretty well.

By far the most difficult part that I experienced as an educator and as a principal was dealing with the mental restructuring that had to occur once we accessed this information through X-PRESS Exchange.

What happens when a classroom teacher has access to every major international news wire service in the world in real time? What happens if we can monitor weather data up to the minute from all over the world? What are the implications in classroom teaching? How is a teacher organized differently? What happens to the role of the teacher? Will the teacher continue to be primarily a lecturer, or will the teacher's role change more to facilitator, planner, collaborator?

I felt very strongly about these issues and wrote to the executive vice president, chief operating officer of TCI, Mr. J.C. Sparkman and, surprisingly, received a call from him a couple of weeks later asking specifically what you think needs to happen to address the other side of the issue.

And it was suggested at that point that perhaps working laboratory schools be developed where schools could be fully equipped with some of the tools that we have been talking about today, and a close analysis could be made through experimentation and the encouragement of innovative approaches to teaching and learning. What could we learn about the real process of teaching and learning that could be shared with other educations?

Carrollton High School became TCI's first laboratory school in 1990 and we learned a great deal. And we found that through this process of experimentation, other educators became interested in the most effective applications of some of the resources.

And that grew to the formation of the position which I now hold with TCI. I am not involved in the day-to-day operations of the cable company. My job exclusively is to work with our 450 systems throughout the country to further implement the education project, to serve as a liaison with Cable in the Classroom, to address the issue of teacher training, and to further experimentation in other areas of the country.

Presently TCI is operating four showcase laboratory schools. Our intention is to open a laboratory in a cross section of America. We have seen what can happen in a small town rural area. We also have a project in suburban Portland, OR. We have one here in inner city Washington, DC, where the issues of teaching and learning are much different than they are in a rural area of the county. We have a project in a larger urban area, and we are planning 37 additional smaller projects which will serve as instructional hubs, teaching training centers in States across the country.

I would like to go into some of the specifics of those laboratory schools and what we are learning. As a matter of fact in the Georgia project, it was interesting to tie in to Georgia's effort to develop a proposal for the New American Schools Development Corp. addressing the six national educational goals that were presented in the America 2000 project.

As you recall, the No. 1 goal there is that every student, every child in America, will arrive at school ready to learn in the year 2000. It is a very lofty goal. For the education community, we have just extended their constituency to birth.

And working with the community in Carrollton, GA, we examined cable technology and resources along with other existing and emerging technologies, to develop a plan to bridge the gap between the schoolhouse and the home and the workplace. Currently those schools are interconnected with optical fiber. Every classroom is capable of interacting with every other classroom.

The school system identified every at risk child in the community and we have wired the homes of those children for cable and have assigned a channel to serve as a pipeline into those homes. As a result of that, agencies which also work with educators to address the well being of children have moved into the school system, The Department of Family and Children's Services, Court Services, the Health Department, Human Resources are all under one umbrella now and are planning to utilize this pipeline into the home, so we will not have to count on all the parents coming to the school for information and services.

In addition, and something that perhaps has not been addressed as directly as it should be, what about teachers who are in colleges of education today training to teach in the classrooms of tomorrow? This project in Georgia also links through optical fiber the school system in every classroom to a college of education, so that teachers who are training to teach in tomorrow's classrooms can see into these classrooms utilizing this technology.

Working with the industry and Cable in the Classroom, we are continuously looking for ways to better address the issue of teacher training. Because, quite frankly, teachers have not been accustomed to dealing with up-to-the-minute information. Teachers have not been accustomed to dealing with 500 hours of educational programming. How do you do that and maintain the integrity of the curriculum?

We are finding some extremely exciting applications, and I will not belabor you with example after example but I would like to point to a couple that happened as a result of experiment in lab schools. A Government teacher was teaching from a textbook which had the same flowchart of how a bill becomes a law in this country that was in that textbook when perhaps all of us were students.

That flowchart has not changed dramatically. But using C–SPAN programming in the classroom, this educator attempted to show in real time what happens as a bill follows this process. And I was hoping that one day I would have this opportunity to appear before the committee and share this story.

A discipline problem derived from that teacher's application. It turns out that as the teacher was walking around the classroom one afternoon toward the end of this particular unit, one of the students had opened the textbook to the flowchart. And where the arrow pointed to a subcommittee box, the student had taken a black felt tip pen and had drawn 10 big black X's around the subcommittee box. And he was immediately reprimanded by the teacher and sent to the assistant principal's office.

The student told the assistant principal I have done nothing wrong. The textbook is wrong; I appeal to the principal. He came to see me and he explained himself. He said you know in Mr. Langford's classroom when we watched how a bill became a law and we watched subcommittee hearings; it occurred to me that those people that sit behind the Senators and the Congressman also play a key role in the process.

In fact this student had gone out on his own and had researched staff and the role they play in how a bill becomes a law. And it turns out that this student anyway, had viewed that programming much more critically even than the teacher had in mind.

John Kuglin pointed out the value of newsroom and news stories. X-PRESS Exchange, the data service, also delivers sports statistics from every professional and collegiate sports activity in the country. In a semester's controlled experiment, using only sports statistics with 68 low achieving math students, math achievement increased dramatically, almost 48 percent when Michael Jordan's performance the night before, the statistics of his basketball performance could be brought into a math class and students could use those types of things in a math lesson.

In fact in the second semester students actually started plotting how Michael Jordan performed at home and how he played on the road, and actually went into making predictions solving for *x*, doing some elementary algebra, something that traditionally we had thought these students were not capable of doing.

So far beyond the technologies themselves are the applications. And our company is as committed to supporting training and experimentation and working laboratories as we are to wiring school buildings and providing electronic hardware and software.

I always like to use the example that in education I always believe if I could have resurrected a person that had been dead for 100 years and brought them back to life and blindfolded them and taken then into any modern bank in America and remove the blindfold today, I do not think they would realize where they were or what was going on—or to any shopping center. But I contend that you could take them into any schoolhouse in America and they would recognize where they were immediately because things have not changed a great deal.

Almost all the research in studying student's involvement in the learning process points to the fact that the more actively they are involved, the more they learn. Well to actively involve students requires new tools for teachers. And with an infrastructure like cable that is currently reaching some 80 percent of the schools in America passed by cable, we have an infrastructure to deliver some exciting resources.

I would also like to address the issue of what we are doing for parents and some other areas. Scottsdale, AZ is a case in point. In that community, retired teachers have been organized and come into the school system in the afternoons. And in a small studio which is nothing more than a couple of floodlights and a camcorder, they are available on the local access channel in that community to receive call-ins from students who are having difficulty working homework assignments.

Now that is not technology that costs a lot of money, but it is a way to bridge the gap with existing technologies and existing resources in a community to address some real issues. And that group is very proud of the fact that they fielded close to 2,000 calls last school year, so it is seen as a viable service in that community.

I would also like to point out and stress the fact that Cable in the Classroom is not just good quality programming. Cable is not just television; it is data delivery. It is also software delivery. In fact in our schools next year we will launch a new product called Media Center which will, in addition too delivering data and news and weather reports, will deliver fully developed multimedia interactive software to schools free of charge, free of copyright.

I, again, appreciate the opportunity to testify this afternoon and would be happy to field any questions you may have.

Senator INOUYE. I thank you very much, Mr. Wright. I would like to remain here for many hours but at this moment we are voting upon something very important to this committee, a spectrum auction. And so I will have to leave and do my chores on the floor.

I thank all of you very much. We will keep the record open for 4 weeks, and if you wish to submit additional testimony or anything to supplement your present testimony, we would be very happy to receive them. And with the gratitude of the subcommittee, the meeting is adjourned.

Senator BURNS. Could I ask—Mr. Wright, I just want to put a footnote on this. Mr. Wright, I want to congratulate you on your project in Cascade, MT, and I know of that project.

And I too want to thank all who have endured here today. Because, you know, the top end can only absorb as much as the bottom end can endure, and I think we have satisfactorily made it through there. And I appreciate the chairman's patience on this and look forward to a lot more better things to come in this area. We want to thank every one of you; it has been most enlightening.

Thank you Mr. Chairman.

Senator INOUYE. Thank you, Senator Burns. The hearing is adjourned.

[Whereupon, at 2:33 p.m., the subcommittee adjourned.]

APPENDIX

PREPARED STATEMENT OF SUSAN MULLINS, DIRECTOR, BERGEN ITV, INC.

INTRODUCTION

My name is Susan Mullins and I am the Director of Bergen ITV, Inc., [Bergen Interactive Television] a countywide fiber optic telecommunications network for education which currently connects 18 high schools and colleges in New Jersey. By 1995, 48 secondary and postsecondary institutions will have the opportunity to be part of the Bergen ITV network. In our informational literature we describe Bergen ITV as an "innovative, cooperative educational project developed with today's technology to better serve tomorrow's future leaders." It is my interest to describe this network for you and to illustrate how fiber optic technology is dramatically changing schools by enriching and improving instruction for students in Bergen County, New Jersey. As a member of the educational community and a spokesperson on behalf of that community, it is also my intent to discuss the positive and far reaching impact of telecommunications on the educational environment.

BERGEN ITV—PERSPECTIVE AND POTENTIAL

Bergen County, a northern New Jersey county which is part of the New York Metropolitan area, is largely a suburban area with three urban centers. There are 75 operating school districts, over 40 of which have high schools. The high schools range in size from about 300 to 2000 students. Interactive television was first studied as a practical, efficient solution to curriculum problems caused by shrinking school budgets and smaller school populations. As the project evolved, however, it became apparent very quickly that interactive television also addresses issues of equity in this county of small and large schools, urban, suburban and multicultural environments. In a forum of shared human and financial resources, schools are discovering that the cost and educational benefits gained by sharing courses only begin to tap the potential of ITV. School districts historically operate as autonomous entities. The Bergan ITV consortium, with its central fiber optic telecommunications medium, is being viewed as a powerful change agent. Schools are sharing educational standards, ideas, curriculum and student development projects, and teacher training programs. In addition, high schools are enriched by collegiate ties which break down the artificial barriers between high schools and colleges, bringing college courses to advanced high school students, and graduate level courses to teachers.

Bergen ITV is New Jersey's only fiber-optic telecommunications project for education. We believe such projects should be widespread across New Jersey and across the nation. In Bergen County we know that our fiber optics-based communication system is substantially upgrading our schools and the learning that takes place in these institutions. We know that this change is imperative if we are to develop the economy of our state by providing a workforce better prepared to address the needs of the global marketplace in which New Jersey business must participate. We believe that our students are our greatest natural resource. Redesigning schools to better serve their needs will bring reality to the new American education goals and prosperity and stability to the American economy.

BERGEN ITV—NETWORK DESCRIPTION AND OPERATION

Bergen ITV is an educational consortium for cooperative interactive television instruction. It is supported by the Bergen County Board of Chosen Freeholders. The infrastructure was designed and provided by New Jersey Bell.

The fiber optic network offers simultaneous voice and full motion video transmission. The network is controlled by an analog video switch located in a New Jersey Bell central office. The switch is programmed remotely by a computer located at the County's Technical School which provides network coordination for all participating school districts and colleges. The network is technically sound, operates trouble-free, and offers excellent quality audio and video exchanges.

The ITV classroom is user friendly. The connection between schools is set by the central computer. Since it takes less than two minutes for that connection to take place, changes in school schedules, special events and student conferences can be facilitated with ease. One switch powers up all of the equipment in the room. Two robotically-controlled video cameras focus on up to seven predetermined objects or areas of the classroom, but also provide the flexibility to pan, tilt, zoom and focus to any place of the instructor's choosing. A push-button console operates the cameras. Voice-activated microphones facilitate audio interaction.

Two-way data transmission has been configured into the model so that homework and tests, for example, can be transmitted from teacher to student and student to teacher during any given class period via facsimile machine. Computer networks can facilitate on-line or live exchanges of keyboarded information. Multi-media computer technology can also be shared. The data transmission can be set up exclusively for education for a combination of educational and administrative purposes.

The network has a flexible design which permits up to four schools to participate in any class conference with full two-way interactivity. Any school in the network can be the sender or receiver of instruction. In addition, any school in the network can send a broadcast (one way) to all participating schools.

Bergen ITV began a skeletal operation in September of 1990 with only a handful of participants and classes. During the 1991-1992 academic year, its first full year of operations, the network operated 29 high school and college classes daily and over 125 staff development and enrichment programs throughout the year, reaching over 4,500 teachers. Programming is scheduled to double during the forthcoming school year. Through fiber optic telecommunications, Bergen ITV is delivering to even school much more than any single school could ever bring to its own students and teachers. Our experience shows that the students taking interactive classes are doing at least as well as students in a traditional setting. To use the words of one of the participating school administrators, "ITV is better than we ever expected it could be—and we've just scratched the surface."

TELECOMMUNICATIONS—EDUCATION'S OPPORTUNITY TO LEVERAGE ITS RESOURCES AND REVITALIZE THE PREPARATION OF AMERICA'S YOUTH

A writer for the Wall Street Journal recently observed that the last great change in education occurred during the 1920s when the nuts and bolts were removed from school desks. Teachers and students gained flexibility in the construction of the physical learning environment. I suggest to you that a fiber optic telecommunications infrastructure may be the next major change. The typical model of the old schoolhouse will take its place in history. That place is where teachers were the masters of all knowledge and where students listened attentively to the master. It will be replaced by a new institution where the teacher is the navigator for knowledge and students have access to the world. Telecommunications extends the walls of the typical classroom environment to include schools, colleges, libraries, businesses, research centers and libraries in neighboring towns, in other parts of the state, around the country and around the world.

It may be argued that the time is not yet quite right for a fiber optic-based communications system. Have sufficient critical educational and economic issues been identified to warrant a decision to improve and expand our communications infrastructure? This is an old question. Must we identify everything we will do with new technology before we make a decision to move ahead? I say no. It is an impossible task. No woman or man can presume omniscience in regard to all of the planning and creative development in the minds of others. Therein, however, lies the potential of fiber optic telecommunications. We do not yet know how to use all of the capacity that fiber optics provides. But we know the capacity is there as creative minds work to improve education, health care and business in this country. I concur with observations made by Dr. George Connick, President of the University of Maine. In speaking at a distance learning conference held last summer in Wisconsin, Dr. Connick emphasized that the infrastructure is a means and not an end in itself. We must not focus too heavily on purely technical issues, as they are confusing to the average person. We must, however, focus on the fact that fiber optic communications technology fundamentally changes the concept and possibilities of access, quality and productivity; such technology erases or eliminates traditional barriers of time and distance. In education, a broadband telecommunications infrastructure can also reduce traditional barriers to student achievement such as limited programs, insufficient teacher preparation and development, limited access to technology, and reduced financial and personnel resources. It has been said that information technology erases isolation and is the power engine driving innovation. A readily accessible telecommunications network can do this for education.

THE BUSINESS—EDUCATION CONNECTION

Educators and business entrepreneurs live in a time that demands increased productivity and accountability and yet provides reduced resources. In such a climate, Americans should not permit their future economic well being and the education of their children to be hindered by old boundaries. In New Jersey, a new telecommunications act this year replaced the 1911 legislation under which businesses were operating for 81 years. To put the 1911 date into perspective, one only has to reflect briefly to realize that automobile and air travel were not commonplace, that space travel was part of science fiction, and that computer chips and microprocessors were not part of anyone's vocabulary. To illustrate how change today is of exponential proportions, reflect upon the personal computers of 1982 or 1983 vintage. They were the wonderful new devices with 64K memory which dominated the marketplace some ten years ago—and which have long since been donated to third world countries and replaced with much more sophisticated computer technology. Without an upgraded infrastructure, neither American business nor medicine nor education will be able to take advantage of the full potential of the new computers.

The correlation between education and economic development is evident. Businesses can only be as good as the people who create, develop, operate and market them. America cannot afford to wait. Its business ventures often fall prey to those of more aggressive foreign firms. Its schools lag behind their full potential for effective public service and development of its youth. We are now experiencing the ripple effect of these recessionary trends—trends which cause a sluggish economy and call into question our ability to compete in a global economy. It is a logical conclusion that America's youth may be our greatest resource.

TELECOMMUNICATIONS—KEY TO DEVELOPMENT OF AMERICA'S VITAL HUMAN RESOURCES

How can a central, fiber optic telecommunications infrastructure successfully develop the human resource of our youth? I will answer this critical question by example. Bergen County educators have access to the first distance learning fiber optic network in New Jersey. The Bergen ITV network is a catalyst for change. It brings people and schools together to share the best that they have. It gives them a forum to develop new and better educational methodologies made possible by this new avenue of cooperation and collaboration. In addition to collaboration for better teaching at the local district level, Bergen ITV has quickly strengthened secondary/post-secondary ties in a manner that is unprecedented. Bergen County students are benefiting substantially from the open, but limited, corridors for interconnectivity. The schools are leading the way to bring public education for all to a level of excellence that exceeds what one school district's financial and human resources could never provide for its own students. We aim toward global connection and the blurring of institutional boundaries.

We are unique in New Jersey, yet we only wish to be an example to others who desire to follow in our footsteps and who, in turn, will enrich and enhance our own educational resources. Our capabilities, for example, do not approach the scope of telecommunications available in the State of Maine where 85 percent of the population has access to a 1.5 million book library by mail and to interactive educational facilities. Even in remote northern sectors of Maine and on small islands off Maine's coast, residents have access to the University's library and to classes operated by the college. We in Bergen County look forward to the time when our own state's telecommunications infrastructure supports widespread use by education. In addition, we and our colleagues in distance education throughout the country look forward to "cost possible" rather than "cost prohibitive" connectivity on an interstate basis.

We believe we are at the forefront of educational innovation, reform and improvement. We aim to maximize our effectiveness by relying on each other's strengths instead of "reinventing the wheel" and by pooling our financial and human resources to develop and improve programs. The economic climate and the future development of our state and the nation demand that we restructure education and focus on greater productivity, accountability, student satisfaction and achievement. Telecommunications provides the catalyst and the forum for that to take place. America cannot afford to wait. I urge you to consider and support a telecommunications development policy that will quickly propel education and business to a position of leadership in the nation and the world as we approach the year 2000.

PREPARED STATEMENT OF FRANK ODASZ, DIRECTOR OF THE BIG SKY TELEGRAPH NETWORK, WESTERN MONTANA COLLEGE

KEEP AN EAR TO THE GROUND

Montanans have established a model of telecommunications technology transfer for empowering grassroots efforts, that fits the American character and way of doing things, through US West's Big Sky Telegraph project

High speed personal computer telecommunications and classic American individualism have brought exciting new low-cost options to the global economic and educational frontiers. If human character is the national resource most important for America's success in the information age, then the rural west represents a motherlode of opportunity.

Four years of low-cost teleliteracy training for rural educators and citizens, delivered through personal computers and modems, is making the case in Montana for rural telecomputing as an empowerment tool for sharing knowledge and expertise in support of individual and community survival in our rapidly changing age of globalization.

Our top-down government and corporate institutions need awareness of the telecommunications-mediated funding models that empower the ingenuity of grassroots individuals to generate the variety of bottom-up initiatives and innovations as evidenced on Big Sky Telegraph and other civic/educational networks.

Thirdgraders in Hobson, Montana, (population 200) learn keyboarding by typing network messages to new friends in Japan and Australia Hobson's High Schoolers discuss global entrepreneurship with their peers in Kamchatka, formerly part of the USSR. The Hobson school spends wider $50/month for ALL global telecommunications costs.

Bottom-up online microcomputer networks, of global dimensions, are now defining how telecommunications technology best fits the needs of individuals and communities. Despite billions of dollars invested in telecommunications infrastructures, few dollars are spent teaching citizens their available options for purposeful use of telecommunications. Nowhere is there a more glaring omission than with microcomputer telecommunications.

Despite numerous K12 global projects, the pending commercialization of the global Internet, and billions allocated by Congress for national information highways, very few institutions have followed Western Montana College's lead in offering instruction in the use of microcomputer telecommunications.

The teleliteracy of national leadership appears far behind the curve as cost-effective options are effectively ignored. The enthusiasm is evident, but the vision falls short of common sense.

During the 1980's, 50 percent of the Rocky Mountain ranchers and farmers lost their ranches and farms, in an age where a modem-generated second income might have saved their families' homesteads. Not knowing what options exist, being an information "have-not," threatens disaster for rural America.

Rural Americans need the broadest possible teleliteracy to know their available options. The technology is already here! Low-cost notebook microcomputers with modems offer the most affordable, accessible telecommnunications option available today, offering unprecedented individual opportunities, but few have yet learned of the power available.

Personal computer communications is the most versatile telecommunications technology available for connecting existing resources with human needs. We can begin today with intelligent, sensitive practical use of microcomputers and common phonelines to prepare citizens for the day when higher capacity systems will become available.

The inherent opportunity is for each community to mobilize resident knowledge, experience and talent into a proactive "community knowledge trust." Proactive librarians are needed to help inform community members on what information they will most probably need to survive.

The global race for economic leadership worldwide will depend on what nations can most quickly and thoroughly empower their individuals with the equipment, training, and vision to fulfill their maximum potential in this unprecedentedly rich infomarketplace. Individual collections of specific information and services can quickly find a global market, distributed among widely scattered individuals linked conveniently by asynchronous telecommunications.

Regional networks, local community networks, and individual automated telecommunications software disks can all work together to provide maximum connectivity at minimum cost.

Here are the working models, in simple terms:

Regional Model: The Big Sky Telegraph is a 386 microcomputer running the Unix operating system with eight incoming phonelines. Anyone can call in and learn the economies of long distance interaction. Prime time rates of 25 cents per minute translate to a nickel per page transmission rates at 1200 baud. Skills emphasized to minimize the costs of online time are (1) capturing text for offline reading and (2) uploading prewritten messages and documents. A five dollar weekly phone budget can mean over 80 pages of quality text routinely sent and received in a twenty minute session. A 9600 baud modem drops costs to under a penny a page at prime time rates!

Any group or organization can request an online public conference and/or files area. Individual innovations are actively encouraged. As information condenses to knowledge which condenses to wisdom, Big Sky Telegraph's goal is to provide the highest quality information possible * * * VITAL infosummaries, to the best we are able to identify such priority information. Most people would far rather have 5 pages/minute of quality information than the 500 pages/second of far more expensive technologies.

Local Model: A "Tinysky" Community network running on a 286 PC, Macintosh or IIe (with hard disk) can provide an entire community with the option for free local access to whatever information and discussion conferences that community desires. Automated single, nightly phone calls can exchange whole conferences and single messages with other community systems and the Internet. Such a system can be used for proprietary, encrypted, global trade communications with individuals using a similar local community network.

This type of "seed" system is only the first step in the evolution of more sophisticated networks and technologies, the pace of which will be dictated by economics. A community system is as changeable as a document on an individual's wordprocessor. A community system can become a living electronic journal of a community's struggle for identity and success, coauthored daily by the citizens themselves.

Offline Reader: A class can line up at the school-based bbs and individually insert their disks to quickly receive all new messages in their selected conferences. Students would then go to their microcomputer workstations to read incoming messages and write their responses. At the end of the period students would reinsert their disks and the bbs would hold their outgoing correspondence until midnight when it would make the single nightly phone call to exchange information globally, costing under $50/month. This model could serve an entire community, until residential PC's are acquired, through a public library or office.

Individual Model: Not everyone wants to be a computer telecommunications whiz, but many people aspire to be writers, teachers, or at least to have their opinions known. A "POINT DISK" would be simply inserted in a PC and a single command given. The disk would initiate an online call, pickup all new messages in selected conferences and send any messages held on the disk. Upon completion of the automated call, the user would read new messages, and respond offline directly onto the disk, using the ondisk wordprocessor. Then the initial command would be repeated and messages would be automatically sent. "Writing for Social Responsibility" (WiSeR) software programs using such POINT DISKS could enlist the talents of ANY community member with almost no training.

The global Internet is expected to be open to commercial traffic by October 1992. All the above models will be compatible with Internet e-mail exchange.

Epilogue: Our nation needs teleliterate leadership to inspire, and provide access, for individual participation via online networks. Someone with faith in Americans that they can determine their own destinies, that western technoindividualism is PRO-AMERICA!

Big Sky Telegraph stands ready to demonstrate how the potential of individual empowerment, through networking, can become reality. "Action" is the watchword.

Science and Math Community Learning Networks: Free Local Access to a National Online Community

The American public needs to understand the relevance of better math and science education toward local prosperity and American innovation in the emerging information-based society. Parent's attitudes have the greatest impact on student's attitudes toward science and math education.

Nationwide, all individuals need to be challenged to identify what quality, relevant science and math education truly can be. Science and math education should not be viewed as separate from entrepreneurship and economic success. Imagination and innovation are the results of fostering the love of learning.

Parents and community members need to be drawn into the debate on education reform. Individual and community survival is everyone's concern. A communitywide K-100 lifelong-learning philosophy needs to be networked into the fabric of American life. Learning must become more accessible and thoughtfully promoted as the satisfying fun it CAN BE!

The best of the nation's ingenuity toward this goal should be electronically disseminated via an online community of communities. Networking and the American innovative spirit hold the promise of a new renaissance, the awakening of a rehumanized infoculture.

The community outreach potential of a local school-based electronic bulletin board could return dividends of access to community talent through 24 hour accessibility for the personalized sharing of knowledge. All individuals in a community should have the opportunity to share with others discussions, innovations, and actions regarding educational and community reform.

A free public access system designed to facilitate such collaborative learning communities, coupled with online librarians, could facilitate such learning to benefit everyone in a community.

The methods of quality interactive online instruction need to be demonstrated and documented particularly when used with other technologies that add audio and video instructional components. Today we're faced with both improving education and bringing costs down. Such hybrid instructional systems can provide instruction that is both better than the average classroom experience AND less expensive!

Distributed conferencing, using automated nightly high-speed modem calls between local public access systems would update daily all matching discussion conferences on all participating systems, thus circulating potentially the finest library resources and current listings of the latest multimedia learning opportunities.

This network model would allow for continuous, rapid, dissemination with maximum impact nationally due to the broad accessibility of the technology at minimum cost. Any IBM compatible Pc, Macintosh or Apple IIe, with a hard disk, could host such a community network. Linked nationally and internationally, that would be compatible with all other such systems.

Formal and ongoing recognition of the innovations of local heroes would highlight nationally the potential of the network, indirectly urging others to get involved.

In the face of accelerating change and disintegrating family structures, there is a growing need to redefine our communities and draw closer together to match vital human needs with existing resources. Survival in the information age dictates we ALL learn new knowledge access skills. New forms of mentorship, of supportive relationships, are now possible, and necessary.

Those of us who have learned to use computers generally learned under the mentorship of a friend. With technology changing rapidly, all of us need more "friends" who can help us survive our need for continued learning.

Our electronic elders with so much experience to share, need vital interests to maintain quality of life and intellect. Our youth are our most commuter literate community members. Most come from broken homes and need adult role models.

A vast untapped energy resource is the goodnaturedness of Americans with a desire to held others. The problem typically is not knowing who needs what or how to help. Online networks free us from the limitations of time and distance. Knowledge and ideas can be shared with 100 percent reliability, 24 hours a day, mind-to-mind, without biases of age, sex, race, or economic status.

Local online systems can provide the quality information and convenient discussion forum necessary for each school district to decide for itself what educational reforms and instructional technologies to adopt. Each school district could have the teletools to glean the best of the best, nationally and internationally, to tailor learning resources for local implementation and local budgets.

Real problems from the local community could become the focus for science and math instruction. Special, community-wide, and nation-wide, learning partnerships could be facilitated showcasing the importance of math and science education for community survival. Self-learning individual empowerment can lead to global entrepreneurship as science learning teaches new manufacturing processes urging innovative product development. Learning global trade economics should be required math for everyone.

Fifty math and science school-based community bbses, each expandable to become a regional multiline system, could be networked to echo reform discussions/solutions, model courses, access to multimedia catalogs, PBS schedules, newsletters instructional technology updates, database search services, local database creation options, online librarians, and instructional expertise facilitated by visionary, accessible leaders in the field.

Each local community could offer public access terminals or loaner laptops through public libraries and through volunteers staff its own learning assistance hotline customized for local needs. Local circuit riders, teletutors, content experts, all could interact at times of their convenience, from their choice of location.

PREPARED STATEMENT OF DR. HOWARD D. MEHLINGER, DIRECTOR, CENTER FOR EXCELLENCE IN EDUCATION, INDIANA UNIVERSITY

Mr. Chairman: I am pleased to provide testimony to the Communications Subcommittee of the Committee on Commerce, Science, and Transportation regarding the use of telecommunications technologies in education. As we work to make our schools, colleges, and universities more effective, productive, and accessible, it is important that we consider the role telecommunications technologies can play in strengthening teaching and learning at all levels of education.

Almost a decade ago I testified before another Senate committee on the impact information-age technology would have on education. I urged that Congress consider establishing one or more national demonstration centers around the nation that would assist schools, colleges, and universities in taking maximum advantage of these powerful new tools. This month, August, 1992, Indiana University will open such a center on the Bloomington campus.

Our facility was made possible by an extraordinary partnership among government, private industry, and Indiana University: Congress appropriated $9.6 million of matching funds toward a building; the State of Indiana and Indiana University contributed somewhat more than $12 million to building construction; AT&T pledged $7 million to creating the technology infrastructure to support voice, data, and video as well as the computers and telephones that enable us to use the system; RCA and several other corporations have contributed nearly $500,000 for video and software support; and Indiana University is budgeting nearly $500,000 annually to operate the center. None of this could have occurred without the initial support by Congress. On behalf of faculty, staff, and administrators at Indiana University—as well as the thousands of school and university officials we shall serve—I want to express my gratitude to you and your colleagues.

The mission of the Indiana University Center for Excellence in Education is to explore appropriate applications of technology for teaching and learning in elementary and secondary schools, colleges and universities, corporate training sites and other settings where adults seek to learn. Our mission is not restricted to distance learning, but it includes efforts to use telecommunications to offer instruction to learners wherever they may be—from making college courses more accessible to high school students, to bringing experts from anywhere in the world to Indiana University students in Bloomington by electronic means.

We believe that the information age revolution, aided by the enormous potential of modern telecommunications, will radically change the way schools, colleges, and universities conduct their business. We also believe that we are now experiencing only the opening rounds of this social/economic/cultural revolution whose ultimate conclusion can only be imagined. Our role is to assist education through a very difficult period of transition while educators learn to take advantage of the new tools and techniques the telecommunications revolution provides.

Our new facility will open in September. I cannot report a list of projects completed; I can, however, describe our facilities and how we intend to use them. The building infrastructure itself sets new standards for how to distribute voice, data, and video among faculty and staff. For example, a new product called SpaceCard enables us to distribute full-motion video throughout the facility less expensively and with greater flexibility than has been true to this time. Our faculty can receive video, voice, and data from anywhere in the world and send it to any classroom or faculty office. We can originate voice, data, and video from many rooms in the building, including a number of faculty offices. Literally, a faculty member can offer his course from his office and send it around the state, nation, and world.

The building also contains a number of specially equipped rooms designed to support experimentation in distance learning. We have a video origination studio that is designed to support instruction to approximately 30 students that will enable the instructor to conduct live, interactive, two-way communication with similarly equipped classrooms on other campuses. A video conferencing room, using Picturetel, enables us to test the feasibility of employing compressed video signals for professional development of teachers and administrators. We also have audio and audiographic conference rooms that support instructors who wish to conduct voice only or voice plus computer graphics dialogues with colleagues and students in distant locations.

While it is surely true that everything I have described exists somewhere in the world to support distance learning, to the best of my knowledge no other university has taken the steps we have to bring all of these technologies together onto one site and focused their use on strengthening teaching and learning in schools and colleges.

While we are only now moving into the new facility and while it will not be fully functional for several weeks, many years of experience lie behind our work. Indiana has had more than two decades of experience in delivering instruction by means of video. The Indiana Higher Education Telecommunications System (IHETS) was established in 1967, and currently services approximately 250 locations including 42 campuses, 38 high schools, 19 vocational/technical colleges, 52 industries, and 73 hospitals. We have also prepared ourselves to use some of the newer technologies: e.g. a professor of Special Education currently delivers his graduate course on teaching handicapped children via audiographics technology to teachers in rural Indiana; students in an Indiana high school gain access to the Indiana University library by means of a computer placed in the school library in order that they can obtain the books and reference materials needed for their research.

When we open our doors in September, we expect to have visitors from across the entire nation. A majority will come from public schools that are about to construct a new building or expect to make a major technology purchase. One example is a consortium of schools in the upper peninsula of Michigan who are seeking our advice regarding how to build a telecommunications system that will link their widely separated schools. Other visits have already been scheduled with colleges, universities, correctional institutes, and corporations: Each are anticipating major investments in instructional technology, including for distance learning, and are seeking vendor-neutral advice.

Simultaneously, we shall pursue a number of research and development initiatives, including the development and testing of "electronic textbooks," requiring the use of sophisticated telecommunications devices. We are also conducting research on how to make electronic data bases more accessible to schools. Finally, we shall operate institutes to train educators in the use of telecommunications for distance learning.

LESSONS LEARNED

Perhaps some of the experience we have acquired over the last decade, while establishing the Center for Excellence in Education, will prove useful as members of Congress consider what steps need to be taken in helping schools and colleges take advantage of advances in telecommunications.

- *Rapid chances in technology.* The technology that drives and supports telecommunications is changing constantly, making it nearly impossible for schools, colleges, and universities to stay on the leading edge. Because the direction of change is to make technology less expensive, more compact, more powerful, and easier to use, educators are often tempted to wait until the market becomes stable, thereby avoiding making decisions they will regret later. It is first necessary to make certain that the installed infrastructure is adequate to support new devices for many years; then, it is important to find ways to roll over existing hardware that users employ so that schools and colleges are not left with out-of-date equipment.
- *Alliances among universities, schools, and private enterprise.* Our Center could not exist without the alliance we have struck with AT&T and the help we have received from other corporations. Not only has AT&T taken an interest in making certain that our facility is a showcase for technology applications, but it has also provided funds to support faculty and staff training and the redevelopment of courses to take advantage of the new technology. Most important of all, AT&T provided access to skilled engineers, scientists, and technologists with knowledge and skills not currently available even to a university the size of Indiana University. If ever there is a role for public-private partnership, it is in the area of technology application to education.
- *Importance of Attitudes.* The most difficult hurdle to cross when adopting new technology is not its cost or complexity of operations, it is the attitude of faculty and staff. While many teachers and administrators are eager to adopt new technology and will devote the time required to master the tools, others are either apathetic or resist its use. Some faculty, who lack understanding of the media, believe that technology will "de-humanize" education; others are reluctant to devote the time required to learn how to use the new tools advantageously. When used properly, the telecommunications media will change teaching—and for the better. But, change can be frightening for some.

- *Need for training.* One way to reduce fear is to make certain that sufficient support is available to help people learn to use the telecommunications media successfully. It is rational to be fearful if one can only sense failure. But, if there is adequate support and training to ensure that the faculty member will succeed, fear is replaced by enthusiasm and excitement for the joy of professional growth.
- *Client-Centered Training.* Telecommunications technology provides an unparalleled opportunity for schools and universities to re-examine their relationship to their clients. More than educators want to acknowledge, education has been treated as a "seller's market." Faculty offer the courses they want to teach in the way they wish to offer them; the client (student) can take it or leave it. Telecommunications makes it possible for clients to promote competition among education providers to a greater degree than in the past. Furthermore, students will be offered more vivid examples of good teaching; they are likely to become better consumers of good instruction. This will occur, if not quickly at least over time; the result should be a powerful incentive for improving the current system of pre-collegiate and higher education in America.
- *Grass roots development.* One of the most striking features of the technology revolution is the degree that it is being driven locally. For example, the most interesting applications of technology to school instruction is not originating in universities or from publishers or major research centers. The best ideas are coming from teachers, taking charge of their own work and making decisions regarding how technology can be used to support them. Universities, state education agencies, and federally-funded laboratories are helping to broker these ideas, as well as adding their own. It is far too early—should that time ever occur—to announce that the solution to use technology has been discovered, and it is time for everyone to adopt it.

TASKS FOR CONGRESS

These are the ways I believe Congress can be most helpful at the present time:

Recommendation 1: Congress should ensure that funds already committed to build the National Research and Educational Network (NREN) be spent so as to make its resources equitable and accessible to a wide range of potential users, including those in schools and colleges who are neither engineers nor computer specialists.

Congress has already authorized and appropriated funds that will lead to a high speed, powerful national infrastructure for data communication. It will be tempting for engineers and scientists to think of their interests first and those of education much later. The instructional value of the fiber-optic highway envisioned by congress should be seen as equally important to its use by researchers. Attention should be devoted to ways that students of all ages can gain access to the learning resources this communication highway will make possible.

Recommendation 2: Congress should avoid making a premature decision regarding which means of delivering distance learning by telecommunications will prove most effective and least expensive. Rather, Congress should encourage a wide range of experiments and let the consumer make choices on the basis of cost, efficiency, effectiveness, etc.

Telecommunications for purposes of instruction may become a profitable business. Various segments of the telecommunications industry will vie for control; individual vendors will try to impose standards that give their products advantages over those of their competitors. Congress should write legislation that guarantees open access to the widest range of vendors possible, further promoting competition and foreclosing monopolistic practices. The best policy for Congress, at this stage, is not assume any particular approach to telecommunications for purposes of education to be the best, or preferred, approach. It is too early for such a decision.

Recommendation 3: Congress should pass legislation that provides for rapid depreciation of hardware and provides tax incentives for corporations that donate depreciated, but still useful, technology to schools, colleges, and universities.

A persistent problem for schools, colleges, and universities is how to stay abreast of rapidly evolving technologies and avoid being stuck with out-of-date hardware. One way to help resolve this issue is to make it possible for corporations to turn over their technology more rapidly and offer it to schools and universities while it remains reasonably current.

Recommendation 4: Congress should appropriate funds to train school and college instructors who wish to take advantage of telecommunications.

The greatest obstacle to overcome in spreading the use of telecommunications to education is overcoming the fear many instructors have about the use of technology in their teaching. The best way to overcome such fear is to provide examples of good instruction by means of telecommunications media and to offer opportunities for teachers to learn how to use these technologies. Dull teaching is not improved by adding electronics; such teaching may appear even more dull. But telecommunications can become the catalyst for exciting new forms of teaching. Ways must be found to support faculty who wish to learn to teach effectively via telecommunications.

Recommendation 5: Congress should make certain that funds appropriated to advance the use of telecommunications in education simultaneously address problems of educational equity in our society.

The problem of equity is at least as great in the distribution of technology resources to schools as it is in every other aspect of education. On the other hand, wise use of resources for telecommunications can become the vehicle for addressing equity issues without appearing to move resources from wealthy communities to much poorer ones. Telecommunications offers the potential for sharing educational wealth without noticeable cost to others.

CONCLUSION

I am pleased that the Communications Subcommittee has taken a special interest in ways that telecommunications can be used to strengthen instruction in schools and colleges. Indiana University's Center for Excellence in Education is eager to assist your efforts in any way we can. I wish to invite you and members of the Committee and Committee staff to visit our Center in Bloomington whenever it is convenient; I would be pleased to arrange a demonstration of different forms of telecommunications for distance learning for your observation in Washington, D.C. if that were to be useful; and I am willing to provide further information about developments in telecommunications applications in schools and colleges as needed by the Committee. I hope you will feel free to call upon me and my colleagues for any services we can provide that will advance your work on telecommunications and education.

Prepared Statement of the National Education Association

The National Education Association (NEA) is pleased to submit this statement concerning the educational uses of telecommunications technology. The NBA represents more than two million education employees in the nation's elementary, secondary, and postsecondary schools.

In the last several years, the use of telecommunications technology in education has grown enormously. Telecommunications has moved from a minor curiosity to a major force in the delivery and organization of education.

Few aspects of schooling have been untouched by this movement. Inside classrooms, students use teleconferencing technology to interview scientists, government officials, and rock stars. They take electronic field trips to France, Russia, and U.S. museums.

In one of the most interesting uses of telecommunications technology, students in one classroom collaborate with students in classrooms in other states and countries on issues of mutual interest. In a "Declaration for the 21st Century," produced by U.S. and New Zealand students and presented at the United Nations Conference on Children in 1990, students half a world away from each other catalogued a number of critical problems facing the world today and enjoined world leaders to address them.

Not only does the technology break down the separation imposed by distance, the project-focused, topical approach of programs like the AT&T Learning Network breaks down the strict separation of subjects in the curriculum. One teacher, who communicated with the NEA Special Committee on Telecommunications, told the committee that telecommunications has served as "the foundation for the development of interdisciplinary units" in her school's curriculum.

Student and teacher roles are changing in these settings. Students assume a more active role in the learning process as they participate in collaborative research, while teachers have become coaches, guides, and coordinators within their classrooms.

Significantly, telecommunications technology plays an important role in breaking down teacher isolation. NEA's School Renewal Network links teachers involved in school improvement efforts with one another and with educational researchers. The network gives teachers and researchers a convenient vehicle for solving problems and sharing information with one another on educational change.

Beyond aiding school improvement activities, telecommunications technologies are used to deliver courses at a distance, provide graduate courses to teachers at their schools and homes, expand professional development opportunities, and increase available resources through access to on-line databases and educational programs.

The efforts of public television and Cable in the Classroom are especially noteworthy.

There is considerable variety in the way telecommunications technology is applied in the classroom—including broadcast audio and video, audioconferencing, videoconferencing, computer networks, and audiographics.

There is even more variation in the telecommunications infrastructure used to deliver programs and information. At the present time, it is a patchwork quilt of satellites, coaxial cable systems, the telephone system, proprietary fiber optic systems, Instructional Television Fixed Service, microwave systems, and broadcast media.

Our exploration of this area has convinced us of both the positive role that telecommunications technology has to play in education and the need for some clear direction in the development of our telecommunications infrastructure and the way we implement telecommunications technology in education. Let me address the issue of infrastructure first.

Up to this point, the debate about telecommunications that has gripped Congress has been conducted largely with a view to input. The focus has been on who should be allowed to do what in the telecommunications industry. There is an equally compelling counterpoint to this, which is: What do we want from our telecommunications infrastructure? Extrapolating from existing projects, the NEA has identified five standards that should guide the development of a telecommunications infrastructure for the twenty-fast century: 1. Interconnectivity; 2. Decentralization; 3. Interactivity; 4. Broadband capacity; and 5. Equity.

The first standard is interconnectivity. As of 1991, there were 92 educational networks worldwide of which the majority were in the United States. This includes only those networks that provide regularly scheduled programming services for distance education, degree programs, and professional development. If we include networks providing database services and various curriculum enhancement products, the number grows considerably.

Educational networks exist across the entire spectrum of transmission systems. Local school districts, private vendors, state education agencies, and other actors involved in the creation of educational networks are all mailing rational choices about the best system for their purposes. In one instance, distance education courses are best transmitted over the public access channels of a local cable system. In another, a satellite or proprietary fiber system is the most rational choice. Perhaps more than one transmission medium is needed, as in the case of the Massachusetts Corporation for Educational Telecommunications. which uses a combination of satellite and cable systems.

From the perspective of the individual user or system, this is perfectly rational behavior. From a societal perspective, it is less than optimal, however. The problem is that, with few exceptions, these rapidly proliferating educational networks cannot communicate with one another. The typical educational network is self-contained and proprietary. In principle, the problem is not substantially different from that of the early computers or digitally controlled machine tools that could not be connected to one another.

The networks that exist do more than provide programming or products at a distance. They literally create new relationships among educators and students. There is an increasing number of new learning communities that are defined by connections and not by geographical proximity. If educational networks remain self-contained, severe limitations will be placed on the effective reach of existing programs as well as on the extent to which this community-building process can proceed. For these reasons, we need to create a telecommunications system that provides seamless connections among all existing networks and access not only to the entire education community but also to the vast educational resources that lie outside it in the larger society.

The second standard is decentralization. At present, most educational networks are highly centralized. Programs originate at a central location. Databases are developed in the same manner. Few opportunities exist for students and teachers to develop and disseminate their own programming to one another. In the era of inexpensive camcorders and multimedia software, this capacity will become increasingly important. This makes the development of an infrastructure that can accommodate a more democratic and open approach to program and product development a matter of growing importance.

The third standard is interactivity. While programs to create vast public multimedia databases are much in the public spotlight at the moment, our inquiry into educational telecommunications has shown us that it is interaction that really drives educational change—the interaction of teachers, students, researchers, and those outside the educational community with one another. By themselves, databases do little to reconfigure and improve the educational process. Adequate means must be provided for a larger community to discuss the information found in these databases in an organized fashion and collaborate on projects which use this new capacity.

Only the public switched network, which is the telephone system, serves this need at present. Whatever the transmission medium, interactivity within distance learning systems is typically accomplished only with the aid of the public switched network. The problem with this is that our public switched network is sorely in need of improvement. Our telephone system can only transmit voice and data. Unless hundreds of voice lines are bundled together, the existing infrastructure of the public switched network can only transmit video with the use of expensive transceiving equipment and, even then, at relatively poor quality.

This brings us w the fourth standard, broadband capacity. Interactive, broadband networks are capable of carrying vast amounts of information (whether video, graphics, still pictures, voice, or data) at tremendous speeds. They would permit groups of students, teachers, and other individuals to collaborate on joint projects in any medium they chose (video, audio, text, or some combination) virtually at will.

We fully expect the need for collaboration opportunities to grow in education as well as in private industry in the coming years. One of the key ingredients of successful educational change is likely to be the ability of teachers and students to collaborate with one another at a distance and thus leverage the talent and resources that exist within public education. The narrow band telecommunications infrastructure that presently serves the United States places severe limitations on the kind of collaboration that can develop within the larger education community.

Broadband capacity is related to our fifth and final standard, equity. Within the United States, recent years have seen the growth of alternative access or bypass providers who furnish data transmission services for businesses using fiber optic lines. Businesses themselves are experimenting with multimedia transmission systems. If our public switched network is not upgraded, we will have a society of telecommunications haves and have-nots. Those who can afford to pay for alternative service will do so, and the vast majority of the population, including education, will be precluded from enjoying the benefits of state-of-the-art telecommunications technology.

NEA's Legislative Program reflects the Association's recognition of the need for enhanced technology to be made available to students and educators. The NEA supports federal financial assistance to local education agencies for technological improvement, including the acquisition of computers and software, the development of software by classroom users, and training in the use of technology.

These are concerns for the future. While on the subject of equity, however, we would like to share with you our concerns about the present. The vast majority of classrooms in the United States lack access to any kind of telephone service at present. This makes them unable to share in the most basic benefits of the telecommunications revolution. Teachers are unable to call parents and arrange meetings; students are unable to avail themselves of on-line services when investigating particular subjects.

Telephone lines alone are not the problem here. When they do exist, schools are charged at corporate rates for basic service. We must find ways in which telephone service can become a ubiquitous feature of the contemporary classroom. In the future, tele-collaborating will become an increasingly prominent feature of work. How can we expect our students to have the skills to enter the work world unless we are able to replicate some of its essential conditions within the classroom?

These are the standards we hold to be critical in developing an infrastructure that will best serve public education. In addition to sharing these standards with you, we would like to make one or two points about the implementation of telecommunications technology.

The first point is that teachers and other education employees are essential to the success of telecommunications projects. Education employees play critical roles with respect to the introduction and use of telecommunications technology in schools. They are planners, problem solvers, designers, coordinators, technicians, researchers, and evaluators. Most important, they are among the primary users of every existing telecommunications system. Their perspectives, insights, support, and commitment to the use of the technology are vital for its successful implementation.

Curiously, governments and companies planning new products and services for education do not include the people who will actually use the system in the planning and design process. If education employees are not included, how can a local or state government determine if the programs will be relevant to classroom needs? How can it determine if a format is appropriate or what kind of support will be necessary to make a program work? We must work to raise public awareness about the need for those who will actually use a system to be involved in its design and implementation.

The second point is that we need to provide greater assistance to teaching professionals who use telecommunications technology in their classrooms. Many programs only budget for the equipment, leaving teachers to learn new technical and pedagogical skills on the job. It will be difficult for these technologies to fulfill their promise to education without adequate training in their possible uses. Funding for the use of telecommunications technology must include training and professional development as well as hardware.

The picture is not that rosy for prospective teachers either. Only about one-third of all teacher training institutions offer instruction in the use of interactive television for instruction and only one-fourth offer similar instruction in the use of audio technologies. This is not acceptable.

Telecommunications technology offers rich possibilities to educators and students that were not available only a few years ago. For this technology to reach its true potential, however, we will need it to be more widely distributed; we will need expanded capabilities in order for us to interact with one another and develop our own programs; and we will require greater involvement in the planning and design of systems and greater support for doing so.

The NEA's Special Committee on Telecommunications was formed in 1990 to investigate the role and impact of telecommunications technology on education and to make policy recommendations. After two years of intensive study, the committee submitted its report to the NEA's policy-making body, the Representative Assembly.

A copy of the report is attached. This statement builds upon some of the committee's findings.

Thank you.

[The Report of the NEA Special Committee on Telecommunications may be found in the committee files.]

PREPARED STATEMENT OF FRANK WILLIAMS, JACKSON COUNTY EXECUTIVE AND CHAIR OF ExCEED

We listened to the hearings on the "Role of Telecommunications Technology in Education" with great interest. Excellence in Community Education and Economic Development (ExCEED) is a nonprofit corporation recently formed to operate an interactive fiber optic based multimedia network in five rural, economically distressed rural counties in Tennessee. We have raised $1.2 million of the estimated $1.5 million required to install our system from grants from (1) the Tennessee Valley Authority, (2) the Appalachian Regional Commission, (3) various state and federal job training and education programs, and (4) from local governments and school systems.

The member of ExCEED are the county governments and public school systems of Clay, Fentress, Jackson, Overton, and Pickett Counties in Tennessee; Tennessee Technological University; the University of Tennessee and Oak Ridge National Laboratory; the Tennessee Valley Authority; and Livingston State Area Vocational School. We plan to have ten sites located in secondary schools by yearend 1992. We are seeking to fund two additional classrooms for the network in the Clay County Hospital and the Tennessee Tech School of Nursing. Planning for the expansion and funding of the network is being done in cooperation with Visions Five Group and its CEO Carl Wright. Visions Five is an association of the county executives of the five counties. We are intensely interested in seeing our network used both for community and educational applications.

Based on our experience with this emerging use of telecommunications technology we wish to make the following observations for your record of the hearings:

1. We do not favor seeing all funding and resources for telecommunications projects concentrated in a single agency. Although dispersing authority creates some inefficiencies, it also allows for alternate approaches to be devised more readily. Additionally a broader spectrum of regions and types of projects are likely to be funded with decentralized management. We doubt our project would have had the political influence necessary to prevail if we were dealing with a single federal supertelecommunications agency, despite the intrinsic merit of the project.

2. We do feel a clearinghouse for telecommunications information could be helpful. Even in our small project with our limited experience, we frequently find we are educating the various federal agencies with whom we deal. The agencies themselves need a ready source for information on technologies and extant projects.

There is a particular need for information on developments in this technology abroad, where significant innovation is occurring but which is relatively unknown in this country.

3. This technology needs to be more generally accepted and understood by agencies involved in rural and economic development. Many of these agencies are still committed to funding such projects as industrial parks and water projects. Although certainly still useful, such projects are of diminishing value in helping us compete in a global economy. Advanced telecommunications capability can be a powerful tool in helping rural areas become competitive.

We have appended a brief description of our project. We invite any interested public officials and agencies who are interested to visit with us to see what we are doing in Tennessee.

[The project description referenced above may be found in the committee file.]

["The Your Educational Services Networks: A High-Capacity, Interactive, Direct Broadcast Satellite System for Education," by G. Gordon Apple, may be found in the committee files.]

NATIONAL EDUCATION TELECOMMUNICATIONS ORGANIZATION

POLICIES AND PURPOSES

The National Education Telecommunications Organization will encourage cooperation and in conjunction with education institutions, states, and territories and other education program providers will establish, as expeditiously as practicable an education satellite and other telecommunications system, to be governed, managed, and operated by a National Education Telecommunications Organization (NETO), as a part of improving equitable and quality instruction and education opportunities for all children and adults which will be responsive to the public needs, education goals of the states and territories, and which will contribute to access and utilization of the nation's education resources.

The National Education Telecommunications Organization, a not-for-profit, nonfederal, voluntary organization will provide new and expanded telecommunication services to be made available as promptly as possible and are to be extended to provide national and international coverage to all schools, colleges, universities, libraries, and other distant learning centers. In effectuating this program, care and attention will be directed toward providing such services to all children and adults regardless of their economic status, personal wealth, or the wealth of their community, and their geographic location, as well as those with economic and geographic advantage, toward delivering efficient and economical access and utilization of satellite and other telecommunication services, and toward the reflection of benefits of these technologies in the quality and charges for such services.

In order to facilitate this development and to provide for the widest possible participation by education institutions, states and territories, and other education program providers in the education satellite, the NETO has established a not-for-profit. public corporation, the Edsat Corporation. The Edsat Corporation will operate under policies established by NETO to operate and manage satellite services to affiliated education and state agencies, program providers and other distant learning centers.

The NETO and its related subsidiary corporations will be organized and operated so as to maintain and strengthen instructional and educational opportunities and services in the provision of communications services to states, schools, colleges, universities, libraries, and other distant learning centers.

BACKGROUND

NETO/EDSAT are non-profit, voluntary "education users" organizations established to govern, purchase and manage affordable and equitable satellite and other telecommunications services on behalf of all America's schools, colleges, universities, libraries and other educational institutions.

The NETO/EDSAT Board of Directors include: Robert C. Albrecht, University of Colorado; Marshall Allen, Oklahoma State University, Sarah Carey, Steptoe & Johnson; Joseph Duffey, The American University; Jack D. Foster, Center for Strategic Policy Studies; Ben Hambelton, Boise State University; Jack Han non, COMSAT; LaDonna Harris, Americans for Indian Opportunity; Smith Holt, Oklahoma State University; Glenn Kessler, Fairfax School District; Ralph Meuter, California

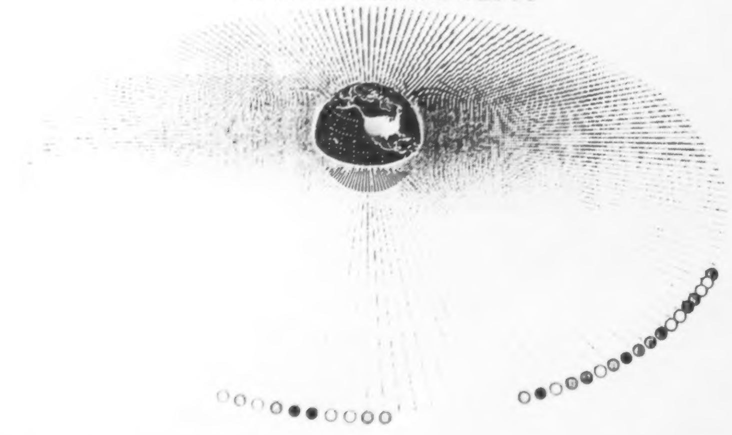
State University at Chico; Mabel Phifer, Black College Satellite Network; Sidney Pike, CNN International, Pamela Quinn, Dallas County Community College District, Texas; Grier C. Raclin, Partner, Gardner, Carton & Douglas; Harlan Rosenzweig, Westinghouse Communications; Mark Spear, ALCOA; David R. Taylor, Western Illinois University; H. Brian Thompson, LCI International; James Tomsic; Shelly Weinstein, NETO; Arthur Wise, National Council for the Accreditation of Teacher Education; Wallace G. Wilkinson, former Governor, Commonwealth of Kentucky; and Dennis Rehberg, Lieutenant Governor, State of Montana.

Governor Wallace G. Wilkinson and other governors raised the issue of the need for a satellite dedicated to education with President George Bush at the Education Summit in Charlottesville, Virginia in 1989. As a result of an EDSAT Institute report, Analysis of a Proposal for An Education Satellite more than 350 educational institutions, state agencies and education program providers met over the summer months in seven outreach meetings to discuss "next steps" to creating a national education telecommunications "user" organization.

BENEFITS TO EDUCATION PROGRAM

- Collocation provides ow-cost and predictable access to satellite services.
- Collocation provides program providers access to greater and greater numbers of downlink users over wide geographic areas.
- Collocation provides the downlink users with a greater number of instructional program offerings during the school and business day.
- Collocation stabilizes your pricing, costs and planning for instructional programming over longer periods of time.
- Collocation eliminates recurring problems on the need to refocus and/or reorient earth station equipment to receive scheduled programs.
- Collocation to a satellite dedicated to educational instruction means program providers, "Affiliates of NETO", are partners in the historic start-up of a transparent telecommunications infrastructure linking space and land segments, through cable and telephone lines to reach into America's classrooms with live interactive video, voice and data programming.

U.S. FSS ORBITAL SLOTS



● INDICATES PRESENT ORBITAL LOCATION OF EDUCATIONAL PROGRAM SERVICES

PRESS ANNOUNCEMENT

The National Education Telecommunications Organization and the EDSAT Corporation Announce the Opening of "Dedicated Education Satellite Services," as of August 1992

The National Education Telecommunications Organization (NETO) and its subsidiary the EDSAT corporation are announcing satellite services dedicated to instructional education, teleconferencing and special event programming for schools, colleges, universities, libraries and other distant learning centers, to be made available as of August, 1992.

GE American Communications, Inc. is the satellite vendor chosen by NETO/EDSAT to provide the start-up services and to assist NETO in developing a satellite-based telecommunications system. The highlight of this system is to allow more satellite collocation to take place almost immediately. This will give most of America's schools access to multiple choices in "programming", said Shelly Weinstein, President, NETO.

"We're taking the first step today to seam together a nationwide telecommunications systems dedicated to education", Jack Foster, Chairman of NETO, added. "Many others have tried this before and failed." NETO is the premier education user organization which aggregates the education community to develop and use this system It is a "user owned, user controlled, and user governed effort. That's what is so exciting and most important for its success."

Ralph Clark, President, IBM Education Company joined NETO/EDSAT to announce IBM's gift of a C-Band Uplink and its related equipment located in Crystal City, Virginia to help NETO/EDSAT provide low-cost services for its affiliates.

NETO/EDSAT expects up to 35 to 40 education programmers to use its satellite services during the next six months. Their number is expected to reach over 75 by the 1993 school year. NETO/EDSAT satellite services will reach hundreds of thousands of students in schools, colleges and universities and an equal number of students located in their workplaces.

The American Community Services Network Foundation and the EDSAT Institute announced today discussions leading to an agreement in principle to assist NETO berating an educational satellite system. Details of the agreement terms and financial arrangements are still to be defined and are subject to the boards' approvals. However, all parties expressed a high degree of confidence that an arrangement would be swiftly consummated- ACSN is the founder of The Learning Channel.

"Our way of living has been revolutionized through telecommunications and specifically through the last 40 years of television. For many years the education sector grew very slowly in this field with everyone going their own way. Collocation for education programmers to one satellite means to the education community what collocation meant to the cable industry and consumers. When all the cable programmers collocated on one satellite it meant the consumers could get up to 40 or 50 channels in their home with the flip of a TV switch. Collocation to one satellite means that schools, teachers in classrooms and students have multiple choices of live interactive video, voice and data programming," noted EDSAT Corporation Chairman, Brian Thompson. Mr. Thompson is CEO & Chairman of LCI International.

The EDSAT Institute, a not-for-profit education and information organization provides NETO/EDSAT with technical and administrative management. Financial and in-kind support has come through Westinghouse Communications, Westinghouse Electric Foundation, National Aeronautics & Space Administration (NASA), COMSAT, Scientific Atlanta, Black College Satellite Network, Oklahoma State University and others.

NETO/EDSAT are non-profit, voluntary "education users" organizations established to govern, purchase and manage affordable and equitable satellite and other telecommunications services on behalf of all America's schools, colleges, universities, libraries and other educational institutions.

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[Miscellaneous newspaper articles may be found in the committee files.]

LETTER FROM SIDNEY PIKE, PRESIDENT, CNN INTERNATIONAL SPECIAL PROJECTS

APRIL 2, 1992.

The Honorable SAM NUNN,
U.S. Senate,
Washington, DC 20510

DEAR SENATOR NUNN: A newly-formed corporation, Education satellite Corporation (EDSAT), has advised me that there are bills being prepared to create a domestic satellite dedicated to the distribution of educational signals throughout the United States. The purpose of this would be to enhance distribution by State and National educational institutions providing long distance learning as well as the sharing of educational programs.

I urge you to support S. 2377 and other forms of legislation that are in consonance with this legislation so that educational institutions can take full advantage of the new satellite technologies.

Sincerely,

SIDNEY PIKE.

LETTER FROM SIDNEY PIKE, PRESIDENT, CNN INTERNATIONAL SPECIAL PROJECTS

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Sincerely,

SIDNEY PIKE.

MEMORANDUM FROM BEN HAMBELTON, ASSISTANT EXECUTIVE VICE PRESIDENT AND DIRECTOR, SIMPLOT/MICRON INSTRUCTIONAL TECHNOLOGY CENTER

MARCH 31, 1992.

TO: Senator Larry Craig and Congressman Larry LaRocco

DEAR SENATOR CRAIG and CONGRESSMAN LAROCCO: Senator Burns and Senator Simmons have introduced legislation to provide a loan guarantee for the acquisition of a communications satellite for education.

I strongly endorse this legislation and encourage you to vote for the legislation when it comes to the floor of the Senate. As a small rural state, we find it increasing difficult to procure the satellite time necessary to deliver education and training at affordable rates. In addition. a satellite devoted to education would allow all education programming to be co-located on the same satellite, thereby making it possible for schools to receive more than one channel at a time. Under the present situation every satellite education provider does their own thing and their programs appear on many different satellites, preventing a school from receiving more than one channel at a time. Since a good deal of this programming is sponsored or funded by tax dollars, we are wasting money by so limiting access to instructional resources.

I have felt so strongly on this issue, that I have consented to serve as a member of the Board of Directors of an organization that is devoted to bringing educational providers together on the same satellite and providing access to that time at affordable rates for educational organizations. This participation has been approved and funded by the state of Idaho's Telecommunication Council of the State Board of Education.

This organization, the National Educational Telecommunications Organization (NETO), has conducted studies and meetings with educational institutions regionally throughout the United States and can demonstrate a viable business plan to own and operate a satellite for education. Many state and individual educational organizations are poised to transfer their current and future satellite communications business to an Education satellite, if we can obtain the loan guarantees to procure one.

I urge you to do everything you can to help education to help itself in delivering quality educational opportunity to all of our citizens. It is especially important for a state like Idaho, if we are to provide equity of access to quality education, we must use modern communications media and it must be affordable and it should be coordinated with other providers to achieve maximum good. This legislation would accomplish this. Please support this effort

Thank you.

LETTER FROM DAVID R. TAYLOR, DEAN, COLLEGE OF EDUCATION, WESTERN ILLINOIS UNIVERSITY

NOVEMBER 11, 1991.

Honorable PAUL SIMON,
U.S. Senate,
Washington, DC 20510

DEAR SENATOR SIMON: As I am sure you will remember, the college of Education at Western Illinois University has been offering direct instruction to students, staff development programs for teachers, and other educational programming using an interactive television system delivered by satellite. The College of Education at Western, in partnership with the Illinois State Board of Education, was part of the TI-IN United Star Network that was awarded one of the four Star Schools Grants in 1988. The specific purpose of our grant was to deliver direct instruction to students in rural and remote schools which had a high concentration of Chapter I children enrolled. A critical component of our effort was to insure that issues of access and equity, with respect to educational opportunity, were addressed.

The WIU/ISBE Satellite Education Network did not cease to operate at the end of the grant period. Currently we are offering almost 300 hours of live interactive programming, not only to Illinois audiences but to audiences across the United States. We were successful in insuring that we could continue operation by becoming, to a degree, self-sustaining. This occurred with the help of State Representative Bill Edley through sponsorship of a bill that helped bay for the cost of our satellite uplink and provided funds for network staff and equipment.

However, Western, like other institutions using satellite interaction for distance learning, must purchase satellite transponder time from commercial vendors, at commercial rates, in the same manner as any private television station desiring to make a profit. This is a cost that is passed on to the schools as a cost of instruction. The added cost is becoming ever more prohibitive and will ultimately lead to a reduction in televised instruction. We have found that purchasing transponder time from PBS does little to cut costs. In point of fact, the rates we pay PBS do not differ significantly from those charged by profit-making organizations.

Ms. Shelly Weinstein, Director of EDSAT, attended a meeting focusing on the federal role in education telecommunication on October 31, 1991, at which I am told you were also in attendance. It is my understanding that both CPB and PBS representatives were also present. Although not the focus of the meeting, I do understand that CPB and PBS indicated it would not be necessary for the EDSAT Institute to develop a not-for-profit electronic highway since they already had a network in place. However, networks are rot highways open for general traffic; they are more like toll roads.

My concern is that CPB and PBS have a basic television network in place but they do not have an integrated land and space highway dedicated to the equitable distribution of cost effective instructional and educational programs. This is critical for those of us who are dedicated to the delivery of instructional television programming. I can assure you that we, a public university, presently pay near commercial rates for the use of PBS transponders. We have access only when time space is available and not in conflict with their own program schedules. This does little to help us deliver instructional programming to students at a reasonable cost.

There is a critical need for a National Education Telecommunications Organization (NETO). As a member of the EDSAT Steering Group I am seeking your help to make NETO a reality. On November 20, 1991, there will be a meeting in the Dirksen Senate Office Building (Room 430) to discuss these issues. It is my intention to be in attendance at the meeting and hopefully to have time to discuss with you, before or after the meeting, our plans and hopes for she development of this new electronic highway dedicated to education.

The last time Mrs. Simon visited Western we were able to demonstrate to her how we were delivering a course called Advanced Placement English to students in over 100 schools throughout the State of Illinois. At that time she indicated how firmly you believed in the power of telecommunications to deliver interactive instructional programming to students who would not otherwise be able to receive instruction in the advanced sciences, mathematics, foreign languages, and English. Western Illinois University is one of the leaders in this effort and with your help we can continue to deliver direct instruction to students and be a positive change agent for the restructuring of American schools through the use of technology.

Sincerely,

DAVID R. TAYLOR,
Dean, College of Education.

PREPARED STATEMENT OF RON SCHOENHERR, SENIOR VICE PRESIDENT, SOUTH CAROLINA ETV

Since its ynception1 public broadcasting has been built on a central mission: education. With a strong infrastructure already in place, America's 341 public television stations and 32 state networks work locally and nationally for education reforms at all levels. In fact, when President Bush announced the six National Education Goals, public broadcasting was able to demonstrate that we were already working to make them a reality.

As early as the 1950s. we were using technology to put the best teachers in classrooms across the nation, to foster equity, and to create otherwise unavailable opportunities for learning.

From this very humble beginning we are today making a real difference for millions of Americans of all ages.

Let me begin with early childhood education. Public broadcasting helps children attain readiness to learn—the first National Education Goal—through services like the Congressionally-funded Early Childhood Professional Development Network. Launched this year in my state, this satellite-based initiative provides live, interactive training and resources to Head Start teams working with Native American, migrant, and Alaskan village children in 11 states.

The Sesame Street Preschool Education Project, or PEP, is designed to help childcare providers develop the learning abilities of children ages two through five. Funded by the Dallas Foundation for Health, Education, and Research this partnership of station KERA in Dallas, the Childcare Partnership of Dallas, and the Children's Television Workshop provides training and support materials to enhance the education goals of each "Sesame Street" episode. So far, PEP has reached nearly 1,000 childcare providers and 12,000 children.

In Toledo, WGTE-TV is providing area childcare and daycare centers with broadcasts of "Mister Rogers' Neighborhood." The project is especially targeted to help endow economically disadvantaged children with a sense of security and self esteem.

In South Carolina, for more than a decade, we have furnished childcare workers and parents with early childhood training tapes. Distributed statewide and nationally, these tapes make quality professional development readily accessible to a traditionally underserved group.

Public broadcasting also plays an integral part in educating students in grades K-12. Eighty-three percent of public television stations devote an average of five hours a day to instructional programming. They reach 69,775 schools, 1.8 million teachers, and 29 million students.

Public television, the first to use satellite for national distribution, is committed to developing satellite technoiogy to extend students' educational opportunities. The most notable initiative is the Satellite Educational Resources Consortium. SERC is a real breakthrough for education that is working on Education Goal number four, achievement in math and science, through live, interactive classes, SERC gives students in geographically or economically disadvantaged areas the opportunity to study courses like Pre-calculus, Discrete Mathematics, Physics, Russian, Japanese and World Geography by satellite. With computer and telephone technologies, students can interact with their studio instructor and their classmates throughout the

23 participating states. Sixty percent of SERC schools are rural and 71 percent are eligible for Chapter One funds. These statistics demonstrate the power of public television to overcome economic and geographic barriers.

South Carolina has found a way to adapt technology to accomplish on local and regional levels essentially what SERC does nationally. SC EW determined that "short distance" education would expand curricula and create a resource-sharing network for South Carolina schools. Through digital satellite technology, which uses fiber optics to "split" broadcast channels for greater delivery capacity, SC ETV can accept tape and delay centers, where instructional television is recorded for teachers' use, to function as production studios for on-site, supplemental programming; teleconferencing and training; and faculty sharing among schools and school districts. Short distance technology creates a compelling learning environment, saves time and money, prevents duplication of services, and makes important courses available to even the most remote schools.

Today, many college students are adults with work and family responsibilities—a trend that is going to continue. Reports by the Corporation for Public Broadcasting show that 60 percent of students will be pursuing studies outside the traditional classroom setting by the end of the decade. Telecourses, offered through PBS's Adult Learning Service and the Annenberg/CPB Project, give them the flexibility to earn college credit at a local viewing center or even at home. In my state, the University of South Carolina awards more MBA's to students through television than in traditional classes. other stations are using technologies for education, like Nebraska's AG*SAT, a national satellite network that distributes agricultural information to colleges, universities and USDA departments.

Another avenue for training is the Adult Learning Satellite Service, created by PDS in the late 1980s, to provide educational programming to colleges and universities, businesses, hospitals, and other sites.

Public television makes professional development training and resources readily accessible and convenient for teachers. The Teacher Training Institute, headed by New York's WNET and funded by Texaco, uses master teachers to train other teachers in the most effective use of video in teaching science. Teachers who attend the institute go on to train teachers in their own districts. In South Carolina, we broadcast staff development programming over educational television to each school every weekday from 3:00 to 4:00 p.m., with additional resources on educational radio. Last year, teachers took advantage of 795 programs. Programs were also available to administrators, aides, custodians, bus drivers, and others.

Teleconferencing is another avenue through which public television makes quality on-the-job training accessible and affordable. SC ETV's teleconferencing system, the nation's busiest, provides a highly efficient, cost-effective means of meeting and training: in 1991, teleconferencing saved taxpayers $11.5 million in travel and productivity costs for state agency employees. SC ETV also provides technical support to state agencies with high teleconferencing use, such as the Criminal Justice Academy, which have created their own in-house production facilities. The digital system will extend the value of teleconferencing by extending two-way video and audio services to more sites, and will permit multiple, simultaneous teleconferencing among equipped sites, as wall as allow inter- and intra- university faculty end resource sharing. SC ETV provides a similar service to the Health Communications Network (HCN), the nation's largest state medical network, by maintaining a full-time, broadcast quality microwave link for medical programming with teleconferences to more than 29,000 viewers.

Public television has responded to the illiteracy issue by, again, bringing education to the people through efforts like PLUS: Project Literacy U.S., a collaboration of public television and ABC/Capital Cities that for over the past six years has broadcast public service announcements, documentaries, and efforts that reach out to the community. Because nearly half of Kentucky's citizens did not have high school diplomas, Kentucky Educational Television created the successful "GED On TV" and "Learn to Read" series. This effort and many others illustrate public television1s support for Goal five, which calls for literate, capable citizens.

I want to underscore that technology as an educational tool is at the heart of these services, and public television is at the core of their development. Public broadcasting has constantly looked for time and money-saving ways to make education accessible, to improve its quality, and broaden its scope. Public broadcasting, through its pioneering work in developing satellite distribution technologies, created closed captioning for the hearing impaired, and helped develop the Descriptive Video Service for the visually impaired. We adapt technologies to meet specific needs—for instance, Wisconsin Public Television is using a telephone and television network to transmit two-way classes from one school to another. In South Carolina, the Instructional Television Fixed Service, or ITFS, feeds programming to public schools, state agencies, law enforcement centers, technical colleges, and hospitals throughout the state.

On a national level, public television's low-cost VSAT system lets a small satellite dish transmit as well as receive a signal nationwide. VSAT will let users, including schools, homes, businesses, and libraries send as well as receive data, graphics, texts, audio, and low-grade video. PBS's Telstar 401, funded by Congress end on schedule to become operational in late 1993, will be America's education satellite, using new capabilities to expand the range of our educational services. We will be using up to six transponders, each able to provide as many as 20 channels simultaneously. Each channel can deliver high quality two-way video and audio services for education. What this means is that we are building a national system that can revolutionize education in America. By building on this existing infrastructure, the federal government can avoid costly duplication in its educational technology efforts while providing a telecommunications system to the nation that is accessible, cost-effective, and ensures equity. The PBS satellite can provide the distribution, and the stations located throughout the country can provide the instruction.

Public television has a track record for education. For the first time ever, because of the technology now available to us, W9 can make quality education on any subject equally available to every child in this country. Goals that most thought impossible are now financially and technically within our reach. The only thing standing in our way is whether we have the will, the determination, and the courage to engage in the difficult process of bringing about change. I believe that we do. I look forward to working with you to create the classroom of the future.

PREPARED STATEMENT OF KAY ABERNATHY, BEAUMONT INDEPENDENT SCHOOL DISTRICT

In Texas we believe that an educational system which prepares students for productive and satisfying roles in our 21st century democratic society must take advantage of an array of modem tools and techniques, including technology and technology use.

As Instructional Technology specialist at Beaumont Independent School District, I work directly with Texas teachers who have access to the Texas Education Network, a state initiative about to be one year old on August 26, 1992. These teachers see technology as a catalyst which promotes interest and curiosity and offers an enlarged window to the universe.

The telecommunications technology I will share with you centers around the telephone in the classroom. Alan November, an educator now working in Illinois and a 1988 Crista McAuliffe Educator, believes that we are in the business of preparing knowledge workers where students solve complex problems within team settings using community resources such as local industry, hospitals, social service agencies, and senior citizens in the learning and teaching world. The natural consequence of involving the community results in schools needing to be more connected to the community; and as we progress, we must invest more in the communications technologies. There is a shift to technology that is more focused on connecting students and teachers to each other and to the world outside the school walls.

The telephone—probably the most powerful communication technology ever developed—connects our students to the community and the community to our students. At Homer Drive Elementary School in Beaumont this past year, students used a speaker telephone to connect to Mayor Evelyn Lord in telephone interviews so that all students could participate. Students also connected to other students in an Hawaiian elementary school and participated in their simulated space launch. This Crista McAuliffe Project evolved because teachers were brought together by the National Foundation for the Improvement in Education to plan telecommunications projects for their classrooms. Bringing teachers together to dialogue about teaching and learning impacts student outcomes.

The telephone, a computer, a modem, and telecommunications software are technologies which form the basis for our Teachers Electronically excited And Sharing (TEXAS) Crista McAuliffe Project initiated during the past school year also. The multi-district project was conceptualized during the 1991 Stanford/Crista McAuliffe Institute experience sponsored by the National Foundation for the Improvement of Education. This model project is a Texas-initiated conference on the Texas Education Network featuring a thematic curriculum integration approach using technology in the classroom. Studies show that technology use is most successful when teachers bring technology into the curriculum context where students are actively engaged in learning.

Project Goals. This specific telecomputing project is designed to bring "real" world problem solving into the classroom for all students as they study community businesses or organizations, relate what they learn to the economy, and write essays suggesting solutions to community problems. Sixty-three Texas teachers of students in grades two through twelve and stretching across many curriculum areas volunteered for the project. Thirty of those teachers work in the Beaumont district.

The project provides participants a connection to each other as they send and receive electronic mail and post information to both the student and teacher conference areas. Teachers are discussing ideas with other innovative thinkers as they join together in a new community of learners.

Addressing Goals. Classrooms are paired with others across the state, giving students and teachers the opportunity to respond to each other. Students and teachers use a personal economic awareness survey to help begin class discussions and then use discussion prompts to generate interest and motivation in the classroom. Questions for "experts" are generated, and public officials and business executives are recruited to answer student questions on the electronic network. In cooperative learning groups, students decide which businesses or organizations in their local communities they would like to study and then conduct a fully developed investigation into the economic impact that company or organization has in the community. The classroom telephone facilitates this learning. A group essay is written, uploaded to the network, and shared with the partner schools for discussion and reaction. Participants are asked to telepublish student essays and share those publications with community organizations. Publications may involve the writings of only one classroom or include essays from other schools. Students make these decisions. The project is designed to provide curriculum connections and collaboration among the state school systems' different sites, teachers, students, and community members.

The Texas Education Network has given Texas teachers and students the opportunity to become part of a whole—taking them away from that isolated classroom of the past. Teachers and students are now beginning to see themselves connected to the world, seeing how their actions have potential for creating their future. The TEXAS Crista McAuliffe Project is an innovative approach encouraging students and teachers to study their community businesses and organizations and see the relationships between what they study and applications to the real world. Students are learning to use skills to make significant contributions to their communities.

Educational/instructional objectives. Specific objectives of the project are:

1. Students will gain a well-developed mind, a passion to learn, a sense of equality, and the ability to put knowledge to work; to make connections between education and the workplace.
2. Students will gain an understanding of the global economy and interdependence, and how Texas businesses, students, and teachers are affected.
3. Students and teachers will become more aware of how the explosive growth of technology has changed the workplace.

Description of uniqueness and innovation. Without a doubt the highlight of the project has been the extension of online telecomputing to a community development project, the TEXAS Crista McAuliffe Economic Summit, for students and teachers held on the Lamar University campus in Beaumont, Texas, on April 28, 1992. Area businesses conducted break-out sessions for students explaining economic development; the global economy and how it affects all people; international competition; the interdependence, interrelationships and the wholeness of the community; skills needed for employment and how those skills are related to what is learned in school; and what students can do to prepare for the workplace.

Public officials including State Representative Mark Stiles, Jefferson County Judge Richard LeBlanc, Beaumont City Councilman David Moore, and Beaumont Independent School District Superintendent Dr. Joe Austin served on panels to answer student questions as students had the opportunity to make connections between school and the workplace. Senator Phil Gramm sent answers to student-generated questions by facsimile from Washington, D.C. on the day of the summit. Homer Drive Elementary School students summarized and reported his answers to the entire group that day. Three student teams videotaped the entire conference—one fifth grade team from Homer Drive Elementary School, Beaumont; one eighth grade team from Marshall Middle School, Beaumont; and one high school team from Hardin-Jefferson High School in nearby Sour Lake, Texas.

Benefits for Students. The following student outcomes indicate the anticipated results from this thematic, integrated approach to learning:

- Focus on community studies
- Emphasis on economic development
- Interactive dialogue with all grades in all curriculum areas
- Telepublished essays

- Oral presentations to community/economic development organizations
- Critical thinking and problem-solving skills
- Continual synthesis, analysis, and evaluation
- Curriculum enhancement and integration
- Whole language concepts
- Relevant math and science applications

Benefits for Teachers. Following are teacher reactions from last fall as participating teachers began to use the Texas Education Network. These copies of electronic messages reveal teacher, parental, and student interests in the project.

Kay, thanks for including me in the reactions to the project. My students are extremely excited and can't wait to start participating and communicating via computer with other students over Texas and the world. Their interest in world events has been sharpened; and since they are so eager, their computer skills and writing ability will greatly improve, I'm sure. It is an excellent teaching tool. It's a small world after all, isn't it? Trudy Holder, Office Education Teacher, Port Neches Groves High School, Port Neches Independent School District, Port Neches, Texas.

This is all so wonderful! I just love this new world. That has also been the reaction of the kids at St. Anne Tri-Parish School. On a daily basis I have parents, students, and administrators asking questions about the new adventure. They are all excited about going beyond the school community to other communities. St. Anne's is excited about being a part of your project and are impatient about a teacher that wants to lay some ground work before they can start. Good luck to all other schools! Jenny Neichoy, Computer Lab Teacher, St. Anne's Tri-Parish School, Beaumont, Texas.

My students and I are very anxious to begin our Crista project Our problem is that we have 50 many ideas. We will spend some time narrowing down so that we get one SUPER project instead of several small ones. The students feel very special about this project. They remember the contribution that Crista McAuliffe made and is still making in the area of technology. They are excited to be a part of such innovation! My students are second through sixth graders in a Gifted/Talented classroom. We meet for three hours each week. We are planning a project that involves looking into the past developments of our small town. We want to compare its growth to the present, then look into the future and make predictions. We will incorporate an artist's viewpoint as well as a look at the economic growth. We hope to get started as soon as our modem is installed. We look forward to hearing from all participants. This is such a wonderful experience for all students. The more involvement we have, the more everyone benefits! Susan Gordon, Sour Lake Elementary School, Hardin-Jefferson ISD, Sour Lake, Texas.

TENET is the MOST exciting and challenging thing that has happened to me in the last ten years! My students are extremely excited about the opportunity to exchange ideas and work with students in other parts of the state. This is definitely a change for my classroom—one for the better! Thanks for the chance to participate. I simply cannot go to bed at night until I have worked at least 30 minutes to an hour preparing work for students on TENET. Linda Watson, Office Education, Dumas High School, Dumas ISD, Dumas, Texas.

Description of equipment, software and materials needed. The Texas Education Network allows true integration of technology into the curriculum and the lives of students and teachers. Most districts are using existing computers, software distributed by the state, modems, and telephone lines. Most districts have not yet added a great number of telephone lines. The Beaumont district added seven new lines and then extensions from existing lines on the thirteen campuses involved in the project. In all, thirty (30) classrooms in Beaumont school district have telephone lines for instructional use.

Various federal programs designed to promote such use of telecommunications technologies. In Texas we have the statewide network developed through strategic planning where many community members including business people and teachers were surveyed about their needs for communications. We built what people wanted. In our model for the nation, forty master trainers were trained last August, and several statewide followup training sessions have followed. Those forty trainers train teachers and administrators in regional educational service centers, and those teachers and administrators train people in their districts.

The Texas Education Network is a distributed computer system which provides local access in 15 major metropolitan centers of the state and toll-free lines to educators located outside the local calling areas. The Texas Education Agency provides on-line time for the public school users. Network nodes are named after classroom teachers who have worked with telecommunications.

We believe we have developed a new community (A learners and users—from resources such as the Underground Weather Information, NASA—Spacelink, Cleveland Free NET, and university libraries available through the Internet to conference areas for the Texas Parks and Wildlife, administrator organizations, classroom teachers organizations, technology organizations, United Press International news feeds, CNN Newsroom lesson information for teachers, and curriculum-based student and teacher meeting places online—our users are seeking information from these new sources and using that information to make better decisions.

Access and compatibility to the Internet. Access to the Internet, a federally subsidized program, the ability to download files form NASA archives, and the future availability of ERIC give Texas students and teachers a window to the world. Texas teachers are making connections through the Internet with the National Science Foundation (NSF) projects and with Technical Education Resource Center (TERC) projects.

Recommendations. We need a full, integrated range of technologies—a satellite in the sky is not the only choice. A full range of telecommunications technologies is necessary.

With all of their resources, there is the absence of the Department of Education. The Department of Education is not compliant with that to which the Texas teachers and their teacher friends from Louisiana, from Indiana, from Hawaii, from Alaska, from Washington, from Oregon, from California, from Kentucky, from Maryland, from New York have access. All of these states were represented at the 1991 Stanford/Crista McAuliffe Institute. We need a national initiative so that we have connections to the Federal government and its resources, as well as to each other. We want to see the Department of Education take a major, compatible role in providing information to all schools in the United States.

To promote the use of telecommunications technologies for educational purposes, we need public and private administrative leadership and support so that states will invest in these technologies. Our district and campus level administrators must be encouraged to take a strong leadership role in telecomputing technologies including the classroom telephone. Give us support for what we know excites our students and teachers about learning and teaching—electronic networks. Help all teachers get access to classroom telephones. Help us negotiate with the FCC and the state public utility commissions so that telecomputing will be realistic and attractive for school administrators and local school boards. Students and teachers should be communicating with parents and community members from the classroom. Voice mail systems pull parents and teachers closer together, and research shows increased students learning when this happens.

Because telecomputing helps teachers and students solve problems, because it helps students achieve beyond expectations, because it helps students and teachers to think critically, to question, and to evaluate information, give our state and local school organizations leadership and management support. We will be closer to helping students gain the skills necessary to sustain and promote our democratic society.

["Cable in the Classroom," by TCI of Montana; "Touch the World," by California State University, Chico; "Meeting the Challenge," by CNN Newsroom; and "Cable TV Delivers," by the TCI Education Project affiliated with Cable in the Classroom; may be found in the committee files.]

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ISBN 0-16-040018-X

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